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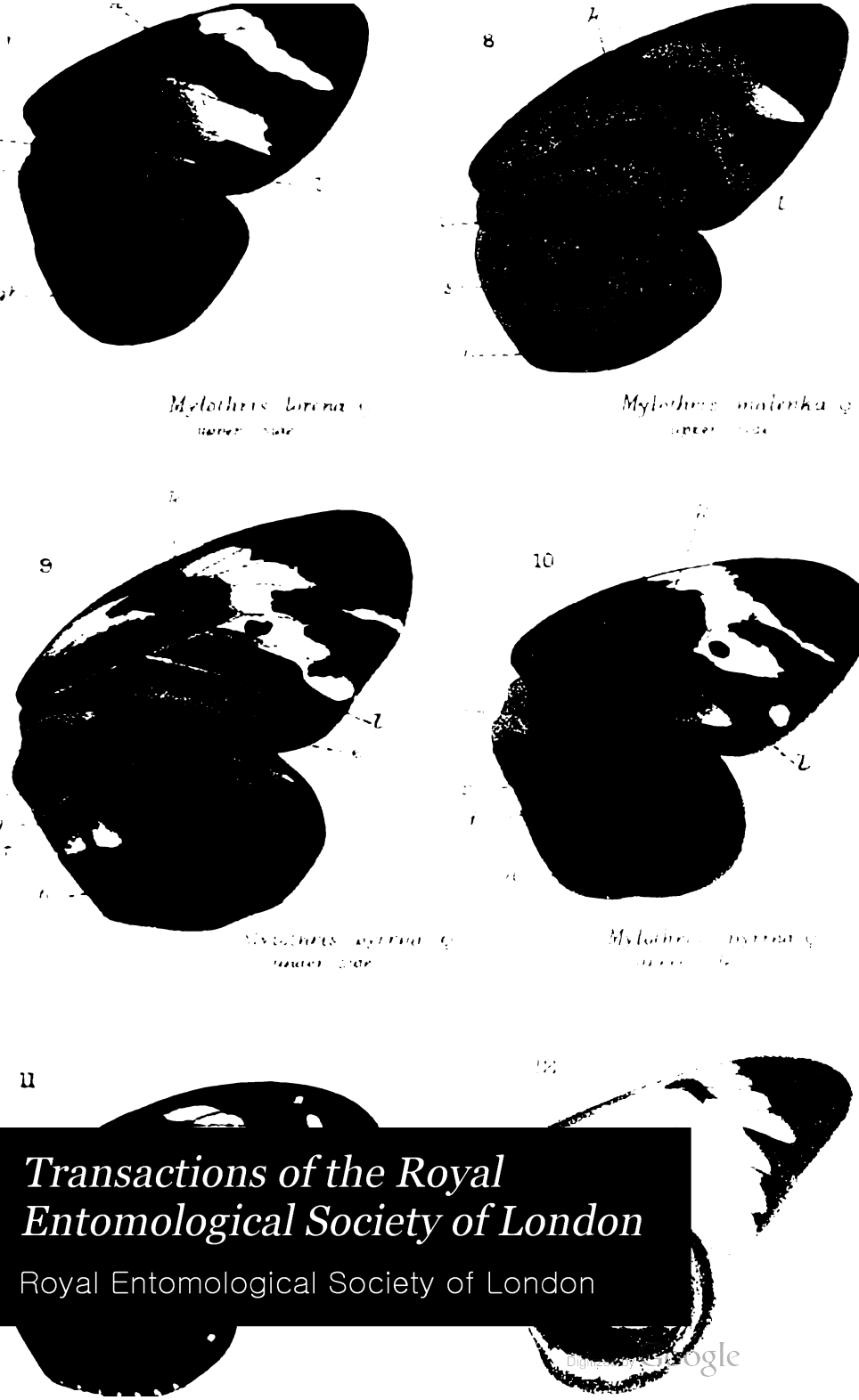

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ERRATA.

TRANSACTIONS.

Page 456, and throughout Sir George Hampson's paper, for Hulst., read Hulst.
Pages 456, 457, 458, and 481, for Iris read Isis.
Page 468, and throughout the paper, for Berg., read Berg.
Page 485, for Avri read Aru.
Page 506, line 2 from bottom of page, dele Z.
Page 507, line 6 from bottom, for Zeit. read Treit. In same line, for vii. read vi.
Page 560, for *octaira* read *octavia*, and throughout the paper.
Page 563, for "Kuysua" read "Knysna."
Page 564, for Crose-Smith read Grose-Smith.

PROCEEDINGS.

Page xxvi., line 25, for "costa," read "inner edge."

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30TH JANUARY, 1897.

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TRANSACTIONS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1896.

I. *On the Heteromerous Coleoptera of St. Vincent, Grenada, and the Grenadines.* By GEORGE CHARLES CHAMPION, F.Z.S.

[Read Dec. 4th, 1895.]

PLATE I.

THE present paper contains an account of the Heteromerous Coleoptera collected by Mr. H. H. Smith in St. Vincent, Grenada, and the Grenadines, under the auspices of the West India Exploration Committee of the Royal Society and British Association. Mr. Gahan (Trans. Ent. Soc. Lond. 1895, pp. 79-140) has already dealt with the Longicornia collected by Mr. H. H. Smith, he at the same time giving a complete list of the whole of the species of that family known to inhabit the West India Islands. It is not proposed to deal with the Heteromerous Coleoptera in the same complete manner, but merely to give an analysis of Mr. Smith's captures. The collections submitted to me for examination contain representatives of seventy-five species—Tenebrionidæ (42), Cistelidæ (4), Lagriidæ (2), Pythidæ (1), Œdemeridæ (8), Xylophilidæ (4), Anthicidæ (5), Mordellidæ (4), Rhipidophoridæ (2), and Cantharidæ (3). Of this

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number forty-nine are described as new, with three new genera. No species of the families Pythidæ and Xylophilidæ has hitherto been recorded from the West Indies. The whole of the genera, which number forty-six, with the exception of *Lorelus* and the three new ones, are common to Central America, four (*Iccius, Mentes, Sosthenes,* and *Conalia*) not being known from South America; sixteen of them, however, have not been previously recorded from the West Indies: *Uloma, Platydema, Talanus, Copidita, Xylophilus,* and *Anthicus* are those best represented; *Lorelus* is known only from New Zealand and Japan, and two of the new genera, *Lorelopsis* and *Menimopsis,* are closely allied to it. Of the total number of species, exclusive of the five cosmopolitan forms, ten only are common to Central America. *Platydema scriptipenne,* Fairm., a well-marked form, has only been previously recorded from Madagascar (? in error for Macassar), and Damma Island in the Eastern Archipelago. Taken as a whole, the Heteromerous Coleoptera of these islands show a considerable affinity with the fauna of the north-eastern parts of South America. The number of endemic genera being very few, and the endemic species closely allied to South American forms. It may be noted that several of Mr. Smith's most interesting captures were attracted to "light" at night.

TENEBRIONIDÆ.

Epitragus.

Epitragus, Latreille, Hist. Nat. Crust. et Ins., x., p. 322 (1804); Champion, Biol. Centr.-Am., Col., iv., 1, p. 23.

Epitragus exaratus, n. sp.

Oblong oval, convex, obscure reddish-brown or piceous; thickly clothed with short, appressed fulvous or fulvo-cinereous hairs, the head and prothorax more or less variegated with denser patches of longer, yellowish-white hairs; the under surface clothed with fulvo-cinereous hairs, and (in fresh specimens) with dense patches of yellowish-white hairs at the sides; the antennæ, palpi, and legs reddish-brown. Head broadly and shallowly arcuate-emarginate in front, the sides of the front rounded and not prominent,

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sparsely, unequally punctate, the punctures finer at the sides than in the middle; the eyes large, coarsely granulated, and slightly oblique as seen from above; the supra-orbital carina indistinct. Prothorax convex, strongly transverse, narrowing almost from the base, the sides slightly rounded, the anterior angles rather obtuse, the hind angles rectangular; the surface thickly, unequally punctate —with spaces here and there more finely and more closely punctured than the other parts,—a narrow space down the middle behind impunctate. Elytra moderately long, wider than the prothorax, rapidly narrowing from about the middle, the apices somewhat pointed; with rows of moderately fine punctures placed in rather broad shallow grooves, which become obsolete towards the apex; the interstices convex, sparsely, minutely, irregularly punctate. Beneath somewhat thickly punctate; prosternal process lanciform, horizontal, and received by the short V-shaped mesosternum. Length 7¾–9½, breadth 3½–4 mm. (♂ ♀).

Hab. Grenadines—Becquia I., Union I., and Mustique I.

Numerous examples. Allied to *E. aurulentus*, Kirsch, from Central America and Colombia,* but smaller and

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* The Jamaican insect referred by me to this species (Biol. Centr.-Am., Col., iv., 1, p. 23), and of which I have recently received some additional specimens from Mr. Cockerell, proves to belong to another species. The following is a description of it:—*Epitragus jamaicensis*, n. sp.—Oval, convex, pitchy-black, very finely, sparsely pubescent, the pubescence partly hidden by a dense, mealy, greenish or glaucous efflorescence, the sides of the head between the eyes, and the prothorax and elytra, with dense patches of ochreous hairs, which are only visible in fresh specimens; beneath pitchy-brown, clothed with fulvo-cinereous hairs, and with denser patches of yellowish-white hairs; the legs and antennæ piceous. Head very sparsely, coarsely punctate in the middle, the sides and anterior half more closely and more finely punctured, the epistoma arcuate-emarginate in front, the sides of the front not prominent, the eyes coarsely granulated, the supra-orbital carina indistinct. Prothorax transverse, moderately convex, trapezoidal, the sides converging from the base and very feebly rounded, the angles acute; the surface unequally punctured—with spaces here and there more finely and more closely punctured than the other parts, and transversely depressed in the middle before the base. Elytra rapidly narrowing from about the basal third, somewhat pointed at the apex, slightly gibbous, the disc broadly flattened and declivous from a little below the base; with interrupted rows of rather coarse shallow punctures, the interstices flat on the disc, feebly convex beyond the middle and very sparsely, minutely punctate; towards the sides and apex with

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narrower, and with more slender legs; the elytra regularly convex and more finely seriate-punctate, the interstices more even. From *E. emarginatus* and *E. sallæi*, Champ., it may be known by the sulcate elytra.

Schœnicus.

Schœnicus, Leconte, New Sp. Col., p. 109 (1866); Champion, Biol. Centr.-Am., Col., iv., 1, p. 18.

Schœnicus brunneus, n. sp.

Elongate oval, obscure reddish-brown, with a faint æneous lustre, shining, the legs and antennæ rufo-ferruginous. Head thickly, rather coarsely punctate, the epistoma rounded anteriorly and prominent, the sides of the front obliquely converging before the eyes, the latter very coarsely granulated, the supra-orbital carina sharply defined. Prothorax convex, strongly transverse, narrowed in front, the sides rounded, the hind angles subrectangular, the anterior angles sharp but not prominent, the surface thickly, rather coarsely, uniformly punctate. Elytra moderately long, wider than the prothorax, subparallel from a little below the base to about the middle and thence rapidly narrowed to the apex, the apices somewhat acuminate; coarsely seriate-punctate, the interstices flat on the disc, feebly convex towards the sides and apex, and sparsely, very distinctly punctured. Beneath, very sparsely punctured; prosternum abruptly declivous behind; mesosternum gradually declivous in front. Length 9¼, breadth 3½ mm.

Hab. St. Vincent.

One specimen. Closely allied to *S. panamensis*, Champ., but differing from it in its more elongate shape, the less

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scattered, irregular, depressed spaces. Beneath, the sterna excepted, thickly punctured; prosternum carinate down the middle, the process broad, rounded at the tip, and received by the very broad, strongly raised, horizontal, V-shaped mesosternum; metasternum broadly concave in the middle. Length 10–10½, breadth 4–4¼ mm.

Hab. Jamaica (coll. F. Bates; Cockerell).

The description is taken from three specimens sent me by Mr. Cockerell. Differs from *E. aurulentus*, Kirsch, in its more gibbous elytra, smaller size, and more sparsely punctured elytral interstices, the latter very uneven towards the sides and apex. The sculpture of the upper surface is almost hidden by a greenish mealy powder.

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prominent sides of the front (in *S. panamensis* the head is trilobate in front), the more coarsely granulated eyes, the coarser, sparser, and more uniform punctuation of the thorax, the sides of which are more rounded, the more coarsely seriate-punctate elytra, etc. *S. oculatus*, Champ., from the Isthmus of Panama, is also an allied form. The genus has not previously been recorded from the Antilles.

Schœnicus antillarum, n. sp.

Oblong oval, obscure reddish- or pitchy-brown, with a faint æneous lustre, shining, the legs and antennæ rufo-ferruginous. Head thickly, rather coarsely punctate, the epistoma rounded anteriorly and prominent, the sides of the front obliquely converging before the eyes, the latter very coarsely granulated, the supra-orbital carina sharply defined. Prothorax convex, strongly transverse, narrowing almost from the base, the sides very little rounded, almost straight in one specimen (♂ ?), the hind angles sharply rectangular, the anterior angles sharp and prominent, the surface sparsely, somewhat coarsely punctate, a narrow ill-defined space down the middle impunctate. Elytra moderately long, wider than the prothorax, narrowing from about the middle; coarsely seriate-punctate, the interstices flat on the disc, feebly convex towards the sides and apex, each with a single irregular row of very fine punctures. Beneath very sparsely punctured; prosternum abruptly declivous behind; mesosternum gradually declivous in front. Length 8½–9¼, breadth 3¼–3⅔ mm.

Hab. St. Vincent—south end; Grenada—Windward side; Union I.

Four specimens, apparently including both sexes. Very closely allied to *S. brunneus*, from which it may be separated by the more acute angles to the thorax, the sides of which are straighter and the surface less coarsely punctured, the elytral interstices more finely and not so closely punctate. The general shape is more oval, the insect in this respect resembling *S. panamensis*.

CRYPTICUS.

Crypticus, Latreille, Règne Anim., 1st edit., iii., p. 298 (1817).

Crypticus undatus, n. sp. (Plate I., fig. 3.)

Ovate, convex, rather shining; black or pitchy-black, with a brassy lustre; the anterior margin of the head sometimes ferru-

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ginous, the two or three basal joints of the antennæ, and the legs, testaceous; the elytra with a strongly angulated oblique fascia extending from the shoulder to the middle of the disc, an angulated transverse post-median fascia, widening outwards, the two connected at the sides, an elongate-triangular patch on the disc at the apex, excised in front and extending to the suture behind, and one or two oblong spots on the disc, flavous or testaceous; the under surface piceous. Head thickly, minutely punctate; antennæ about reaching the hind angles of the prothorax. Prothorax strongly transverse, gradually narrowing from the base, the sides rounded in front, sparsely, minutely punctate. Elytra forming a continuous outline with the prothorax, obsoletely and very minutely seriate-punctate to about the middle, the interstices flat, sparsely, exceedingly minutely punctate. Beneath very finely pubescent, sparsely, minutely punctate. Legs very slender. Length 3–3½, breadth 1½–1⅔ mm. (♂ ♀).

Hab. Grenada—Telescope and Lake Antoine Estates, on the Windward side; Grenadines—Mustique I.

Sent in plenty by Mr. H. H. Smith. Allied to *C. maculatus*, Champ., from Central America, but differing from it in the more intricate elytral markings. These latter vary a little in extent; the two fasciæ are sometimes connected near the suture by a narrow longitudinal line, which extends downwards to the triangular apical mark. In one specimen the suture is brown. The antennæ usually have the two basal joints only testaceous. The seriate punctures on the elytra are scarcely distinguishable. The genus has not previously been recorded from the Antilles. Under rubbish on sandy sea-coasts (Smith).

Opatrinus.

Opatrinus, Latreille, Règne Anim., ed. 2, v., p. 19 (1829).

Opatrinus gemellatus.

Blaps gemellatus, Oliv., Ent., iii., No. 60, p. 9, t. 1, fig. 8 (1795).

Opatrinus gemellatus, Muls., Mém. Acad. Lyon, ii., p. 299 (1852); Fleut. et Sallé, Ann. Soc. Ent. Fr., 1889, p. 421.

Opatrum clathratum, Oliv., Encycl. Méth., viii., p. 499.

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Hab. St. Vincent—Leeward side; Grenada—Balthazar, on the Windward side; Grenadines—Mustique I., Becquia I., Union I.

Recorded by Mulsant from Guadeloupe I., Colombia, and Guiana. Not known from Central America. Found in plenty by Mr. H. H. Smith. It has been taken by MM. Delauney and Vitrac in the islands of Guadeloupe, Grande-Terre, and Les Saintes, and by the Rev. T. A. Marshall in Antigua.

Ctesicles.

Head sunk into the prothorax up to the eyes, the latter transverse and completely divided at the sides; epistoma deeply emarginate in front, leaving the labrum exposed; mentum flat, small, widened in front, rounded at the sides anteriorly; apical joint of the maxillary palpi subtriangular; antennæ moderately long, the four outer joints distinctly widened; prothorax transverse, strongly bisinuate at the base, and closely fitting to the base of the elytra; scutellum small, strongly transverse; elytra convex, oval, obliquely truncate and slightly emarginate on either side at the base, the basal margin raised on either side of the scutellum, the humeri more or less obtuse; mesosternum feebly excavate in front, the sides very little raised; metasternum very short; intercoxal process of the abdomen broad, rounded in front; inflexed portion of the elytra formed entirely of epipleuræ, the latter wide in front and extending to the apex; tibiæ rather narrow; tarsi sparsely clothed with long fine hairs beneath, the anterior pair in the male with joints 1-3 spongy-pubescent beneath and more or less dilated; body convex, apterous, sparsely pubescent.

Two species are referred to this genus. It is allied to *Blapstinus*, but differs from it in the form of the elytra, the broader epipleuræ, shorter metasternum, apterous body, etc. From *Opatrinus* it may be known by the non-trilobate mentum, divided eyes, etc. Also allied, but more distantly, to *Diastolinus*, Muls. Both species live under stones, drift-wood, etc., on sandy sea-shores.

Ctesicles insularis, n. sp. (Plate I., fig. 2, ♂.)

Oblong oval, convex, opaque above, shining beneath, black, the antennæ piceous, with the apical three or four joints ferruginous, the base of the tibiæ and the tarsi piceous or pitchy-red; above

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and beneath very sparsely clothed with short, rather coarse, yellowish-cinereous hairs, these being semi-erect and bristly on the elytra and decumbent on the other parts of the body. Head coarsely, closely punctate. Prothorax strongly transverse, rather sharply margined, moderately rounded at the sides, widest a little before the middle, slightly wider at the base than at the apex, obliquely narrowed in front; the anterior angles rather prominent, the hind angles obtusely rectangular; the surface thickly impressed with coarse, round punctures, which are here and there separated by irregular smooth spaces. Elytra about two and one-fourth times the length of the prothorax, and a little wider than it, rounded at the sides, with rows of very coarse, deep, not very closely placed, foveolar impressions; the interspaces sparsely punctate and sharply costate, the costæ slightly shining at the top, the third and seventh and the second and ninth confluent behind, the second, fifth, and sixth scarcely reaching the base, the first (or sutural) turning obliquely outwards before the base, leaving a triangular depressed space behind the scutellum, and connected with the fourth by the basal ridge; the humeri moderately prominent. Beneath thickly impressed with excessively coarse punctures.

♂. Anterior tarsi with joints 1–3 dilated; anterior tibiæ sinuous within.

Length 5½–6, breadth 2½–2¾ mm. (♂ ♀).

Hab. St. Vincent—Windward side.

Seven examples.

Ctesicles maritimus, n. sp.

Very similar to *C. insularis*; the elytra more opaque; the prothorax a little more rounded at the sides anteriorly, the anterior angles less prominent; the elytra more rounded at the sides and with the humeri more obtuse, the disc transversely flattened or depressed below the base, the seriate impressions not so coarse and more numerous, the interstices strongly convex at the sides, feebly so on the disc, the fourth more raised than the others towards the base.

♂. Anterior tarsi with joint 1 feebly and 2 and 3 more broadly dilated; anterior tibiæ sinuous within.

Length 4¾–6, breadth 2½–2¾ mm. (♂ ♀).

Hab. Grenada—Telescope and Lake Antoine Estates, on the Windward side; Grenadines—Mustique I.

Fifteen specimens, all but two from Grenada.

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SCAPTES.

Scaptes, Champion, Biol. Centr.-Am., Col., iv., 1, p. 222 (1886).

Scaptes ciliatus, n. sp.

Ovate, convex, black, the upper surface completely covered with pale brown, whitish, and fuscous appressed scales, which form a variegated pattern on the elytra (patches of light scales alternating with patches of dark scales in irregular longitudinal series), and with scattered, short, semi-erect, hair-like scales,* which are serially arranged on the elytra; the margin of the prothorax and elytra fringed with long, white, hair-like scales, the base of the prothorax also ciliate; the antennæ black, yellowish at the tip. Prothorax short, rounded at the sides, narrowed in front, and distinctly narrowed behind. Elytra oval, three times the length of the prothorax, distinctly narrowed in front. Length 4, breadth 2¼ mm.

Hab. St. Vincent—south end.

One specimen. Smaller and more ovate than *S. tropicus*, Kirsch (= *squamulatus*, Champ.), from Central and South America, and also differing from it, and from *S. cayennensis* also, in the longer marginal cilia of the thorax and elytra, the thorax distinctly narrowed behind, and the elytra more oval. It is probable that the *S. squamulatus* of Fleutiaux and Sallé, from Guadeloupe, belongs to *S. ciliatus*; their specimen was examined by me some years ago. Under rubbish in low-wooded land near the sea (Smith).

PHALERIA.

Phaleria, Latreille, Hist. Nat. Crust. et Ins., x., p. 300 (1804).

Phaleria chevrolati.

Phaleria chevrolati, Fleut. et Sallé, Ann. Soc. Ent. Fr., 1889, p. 422.

Hab. Grenada—Granville and Telescope Estate, on the Windward side; Grenadines—Mustique I.

Numerous examples, including the typical form and

* Some authors use the term "hairs," and others "scales," for this form of vestiture.

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the var. *quadrinotata*, Fleut. and Sallé, also a variety with the elytra immaculate. I have examined one of the types of *P. chevrolati*, kindly communicated by M. Fleutiaux, whose specimens were obtained at Pont Pierre, in the Les Saintes Is. The insect is narrower and more shining than *P. dytiscoides*, Champ., from the Atlantic and Pacific coasts of Central America. Under seaweed (Smith).

Phaleria fulva.

Phaleria fulva, Fleut. et Sallé, Ann. Soc. Ent. Fr., 1889, p. 423.

Var. The elytra with a common discoidal patch fuscous or pitchy-black.

Hab. Grenada—Windward side; Grenadines—Mustique I.

Five specimens of the typical form from Grenada, and three of the variety from Mustique Island. The type, from Grande Anse, in the Les Saintes Islands, has been communicated by M. Fleutiaux for comparison; it appears to be somewhat immature. In our specimens the last dorsal, and also the last ventral, segment of the abdomen is infuscate or black. Under seaweed (Smith).

Ozolais.

Ozolais, Pascoe, Journ. Ent., ii., p. 457 (1866); Ann. and Mag. Nat. Hist., 4th ser., viii., p. 351 (1871).

Ozolais tuberculifera, n. sp. (Plate I., fig. 1, ♂.)

Broad, very convex, black; the upper surface tuberculate and sparsely clothed with very short, appressed, hair-like scales, which are in great part hidden by an adherent, greyish or brown, scaly coating; the antennæ black or reddish-brown, the two basal joints usually paler, the club flavo-ferruginous; the palpi and tarsi, and sometimes the femora also, ferruginous or obscure ferruginous. Head with the sides of the front subangularly dilated, the space between the eyes with scattered smooth granular elevations; antennæ moderately long, joint 9 broader than long and nearly twice as wide as 8, 10 and 11 subconnate, strongly transverse, 10 much wider than 9. Prothorax very broad, transverse, with the disc gibbous and the sides explanate, rapidly narrowing from the middle for-

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wards, and strongly bisinuate at the base, the latter wider than the elytra; the sides coarsely and irregularly crenate, the anterior angles greatly produced in front, the hind angles sharp and directed inwards; the surface studded with smooth, strongly raised, granular elevations, the disc broadly and shallowly grooved down the middle. Elytra about twice as long as the prothorax, rounded at the sides, gradually narrowing from the middle forwards and rapidly and obliquely narrowing behind, very convex, abruptly declivous behind, the humeri acute and directed outwards; the surface studded with strongly raised, subserially arranged, smooth, granular elevations, which become coarser and more scattered towards the suture, and also with irregular rows of coarse, deep punctures, which also become more scattered towards the suture and are usually completely hidden by the scaly coating.

♂. Head broadly excavate in front, the sides of the front strongly and angularly dilated; the epistoma armed with a long, suberect, flattened process, which is dilated at the tip, the tip itself slightly emarginate.

Length 5¾–8, breadth 3¼–4 mm. (♂ ♀).

Hab. St. Vincent—Windward side; Grenada—Windsor and Balthazar.

Numerous examples of both sexes. This species is not very closely allied to any of those from South America described by Pascoe, or to the Central-American forms described by myself. *O. elongata*, Champ., from Nicaragua, has a somewhat similar cephalic horn in the male; but the horn in that species is placed on the vertex, whereas in *O. tuberculifera* it arises from the front of the epistoma. The smooth granular elevations of the surface arise from tubercular elevations, the interspaces being covered with a scaly incrustation, which hides the sculpture and the very short, fine, hair-like scales. In rotten wood and under logs (Smith).

ARRHENOPLITA.

Oplocephala, Laporte et Brullé, Ann. Sciences Nat., xxiii., p. 338 (1831) (nomen præocc.).
Arrhenoplita, Kirby, Fauna Am.-Bor., iv., p. 235 (1837).
Evoplus, Leconte, New Sp. Col., p. 128.

Arrhenoplita suilla, n. sp.

Oblong oval, moderately convex, opaque, testaceous, clothed with a very fine, short, pruinose pubescence; the entire upper

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surface closely, very finely punctate. Antennæ short, thickening outwardly, joints 5–10 strongly transverse, 5 wider than 4. Eyes rather small, emarginate in front. Prothorax more than twice as broad as long, rounded and sharply margined at the sides, widest a little before the base, moderately narrowed in front. Elytra about two and one-half times the length of the prothorax, narrowing from the middle, subparallel towards the base, without trace of striæ. Leg slender, short.

♂. Head deeply excavate in the middle between the eyes, and armed on either side with a long, compressed, broad, subtriangular horn, the apex of which is furnished with a few fulvous hairs, the epistoma also with a conical prominence in the middle in front.

Length 2–2⅛ mm.

Hab. St. Vincent—Kingstown.

Two males and one female. Three others (all males), from Guadeloupe I., are contained in the collection of M. Fleutiaux of Paris. This insect resembles the European *Pentaphyllus testaceus*, Hellw.; but differs from it in having the antennæ gradually widened from the fifth joint, the eyes emarginate, etc., as well as in its more parallel shape. It has the facies of a *Cis*. *A. cioides* and *A. pentaphylloides*, Champ., from Central America, and *A. bituberculata* (Oliv.), are allied forms; the latter has been introduced into France in an exotic boletus. From *A. cioides*, its nearest ally, it may be known by the single tubercle on the epistoma in the male, the closer punctuation, etc. Found "in boleti" in the old Botanical garden (Smith).

Platydema.

Platydema, Laporte et Brullé, Ann. Sciences Nat., xxiii., p. 350 (1831).

Platydema piliferum, n. sp.

Broad oval, moderately convex, opaque; black or brownish-black, the suture sometimes paler; the antennæ brown or pitchy-brown, with the basal joints, and also the apical one, ferruginous; the anterior margin of the head, the labrum, palpi, and legs ferruginous; the under surface ferruginous or piceo-ferruginous; the elytra clothed

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with short, fine, yellowish-cinereous pubescence. Head and prothorax thickly, obsoletely punctate, the latter very short and rapidly, arcuately narrowing from the base, the eyes widely separated; the antennæ moderately elongate, joints 7–10 slightly broader than long. Elytra a little flattened on the disc, finely punctate-striate, the interstices flat on the disc, feebly convex at the sides, and obsoletely punctate. Length 6½–7¼, breadth 3–3¾ mm.

Hab. St. Vincent—Richmond Estate, on the Leeward side, and Bow-wood Valley near Kingstown.

Four specimens. Allied to *P. sobrinum*, Chevr., from Central America, but differing from it and the numerous allied Tropical-American forms in the very distinctly pubescent elytra, the pubescence being visible even in rubbed specimens. This character is quite unusual in the genus, though many of the species when in fresh condition are clothed with a sort of pruinosity which soon becomes abraded. The punctuation, that of the striæ excepted, is scarcely visible, except under a strong lens, and the surface is very dull. In a rotten log (Smith).

Platydema apicenotatum, n. sp. (Plate I., fig. 5.)

Short ovate, rather broad, convex, opaque; black; the anterior part of the head, the oral organs, the antennæ, the lateral margins of the prothorax, the scutellum, and epipleuræ ferruginous; the elytra each with four sharply-defined flavo-testaceous spots near the apex—one, very small, on the 5th interstice at about one-third from the apex, one, slightly larger, on the 3rd interstice, nearer the apex, one, rather larger and oblique, at the sutural angle, and one near the lateral margin above this, transverse and equalling it in size; the legs ferruginous, the tibiæ slightly infuscate; the under surface pitchy-black. Head thickly, very finely punctate; antennæ extending to a little beyond the hind angles of the prothorax, joints 7–10 strongly transverse. Prothorax acutely margined at the sides, rapidly and arcuately narrowing from the base, more than twice as broad as long, almost smooth. Elytra forming a continuous outline with the prothorax, acutely margined, finely punctate-striate, the interstices flat and almost smooth. Length 4, breadth 2½ mm.

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Hab. Grenada—Balthazar, on the Windward side.

Of this peculiar little species one specimen only was obtained; it was attracted to "light." In general shape the insect somewhat resembles *P. rotundatum*, Chevr. In the markings of the elytra it differs from all the American species of the genus known to me.

Platydema scriptipenne.

Platydema scriptipennis, Fairm., Bull. Soc. Ent. Fr., 1875, p. xxxiii.
Platydema scriptipenne, C. O. Waterh., Ann. and Mag. Nat. Hist., 6th ser., xiv., p. 66.

Hab. Grenada—Soubise, on the Windward side.

One specimen, agreeing perfectly with the type, which is supposed to have been found in Madagascar (or? Macassar), and with an example found by Mr. J. J. Walker in Damma I. in 1891. Also recorded from India, Siam, Java, and Macassar by Mr. Waterhouse, who incorrectly ascribes the species to Chevrolat. The insect must have been introduced into the island of Grenada. Under piles of decaying wood on the coast (Smith).

LORELUS.

Lorelus, Sharp, Ent. Monthly Mag., xiii., p. 76 (1876).

The four described species of this genus are all from New Zealand. The following insect merely differs from *L. priscus*, Sharp, in having the penultimate tarsal joint more feebly excavate above, and the limbs less elongate.

Lorelus brevicornis, n. sp. (Plate I., fig. 6.)

Elongate, rather depressed, shining, glabrous, castaneous, the prothorax and elytra (the suture, humeri, and apex excepted) suffused with piceous in one example, the legs ferrugineo-testaceous. Head thickly and rather coarsely punctate, the eyes not prominent; antennæ short, not reaching the base of the prothorax, moderately stout, the joints closely articulated, 3 a little longer than 2, 4–8 short, gradually decreasing in length, 5–8 transverse, 9–11 broader than those preceding, 9 and 10 transverse, 11 short-oval.

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Prothorax wider than the head, truncate at the base and apex, rather convex, strongly transverse, widest in front, the sides somewhat obliquely converging from the apex to the base, the margins feebly crenulate behind, the anterior angles distinct but rather obtuse, the hind angles minutely prominent; the surface punctured like that of the head, the punctuation a little sparser on the disc than at the sides. Elytra considerably wider than, and fully three times the length of, the prothorax, truncate at the base, subparallel to a little beyond the middle and rapidly narrowing thence to the apex; coarsely, thickly, confusedly punctate, the punctures coarser than those on the head and prothorax. Beneath sparsely, finely punctate. Legs short, the penultimate joint of the tarsi feebly excavate above for the reception of the base of the apical joint. Length 2¼–3⅓ mm.

Hab. St. Vincent—Leeward side; Becquia I.

One example from each locality; I have also seen specimens of it from Guadeloupe, in the collection of M. Fleutiaux of Paris. One of these latter is labelled as having been found in the stems of a *Cissus*, a shrub allied to *Vitis*. In rotten cacao-husks (Smith).

Lorelopsis, n. gen.

Penultimate tarsal joint strongly lamellate, extending beneath the apical joint to about its middle. Epistoma separated from the front by a distinct groove. Eyes small, rather prominent, entire, projecting far beyond the antennary orbits. Prothorax as long as broad, trapezoidal. Body pubescent. The other characters as in *Lorelus*, Sharp.

The single species referred to this genus possesses all the structural characters of *Lorelus*, except as regards the strongly lamellate penultimate tarsal joint and the distinctly separated epistoma. It has somewhat the facies of various Goniaderides and Heterotarsides, but differs from them in the closed mesocoxal cavities, absence of the trochantin, etc. The body in fresh specimens is clothed with very fine, long, erect hairs, which are easily abraded. The elytra are very much wider than the thorax, gradually widened for two-thirds of their length, and confusedly punctate. The thorax is widest in front. The antennæ have the apical three joints widened. Like *Lorelus*, *Menimus*, and *Menimopsis*, the

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genus does not agree satisfactorily with any of Lacordaire's groups.

Lorelopsis pilosus, n. sp. (Plate I., fig. 7.)

Elongate, flattened above, shining, when fresh somewhat thickly clothed with very fine, long, erect hairs, which are easily abraded; piceous or brown, the antennæ and legs ferruginous. Head thickly, somewhat coarsely punctate; antennæ about reaching the humeri, moderately stout, the joints closely articulated, 3 much longer than 2, 4–8 short, subequal, 9–11 broader than those preceding, 9 as long as broad, 10 slightly broader than long, 11 oval. Prothorax rather convex, slightly wider than the head, as long as broad, truncate at the base and apex, widest in front, the sides a little rounded and gradually converging from before the middle to the base, the angles somewhat obtuse; the surface thickly, moderately coarsely punctate. Elytra elongate, gradually widening from the base to one-third from the apex and there more than one-half wider than the prothorax, abruptly narrowing behind; the surface coarsely, closely, confusedly punctate, the punctures much coarser than those on the head and prothorax. Beneath thickly punctate, the punctures very coarse at the sides, the metasternum sparsely and much more finely punctate. Length 3¾–4, breadth 1½–1¾ mm.

Hab. St. Vincent—Leeward side.

Two specimens, one of which is completely abraded.

Menimopsis, n. gen.

Head broad, exserted, slightly raised at the sides above the point of insertion of the antennæ, the epistoma well defined; the eyes excessively minute, consisting of about eight facets only, lateral; the labrum prominent; the mandibles visible from above, emarginate at the tip; the apical joint of the maxillary palpi stout, securiform. Antennæ very short, about equalling in length the width of the head, stout; the joints closely articulated, 1 stout, 2 smaller, short, 3–7 gradually increasing in width, 4–7 strongly transverse, 8–11 forming a well-defined club, 8–10 transverse, each very much broader and stouter than 7, 11 short, oval, narrower and longer than 10. Prothorax short, truncate and finely margined at the base, closely fitting to the elytra, with a sharply-defined, projecting, subcrenulate lateral carina. Scutellum short,

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strongly transverse. Elytra the width of the prothorax at the base, and twice its length, with laterally projecting, prominent humeri, and a narrow, finely serrate, marginal carina. Legs very short, moderately stout; the tibiæ rather narrow, the anterior and intermediate pairs slightly rounded on their outer edge, the spurs short but distinct; the tarsi 5-, 5-, 4-jointed, short, clothed with a few long hairs beneath, the basal joint of the hind pair very short. Coxæ narrowly separated. Prosternum declivous and narrowly produced behind, the apex slightly raised. Metasternum short. Intermediate coxal cavities closed externally. Epipleuræ broad, extending to the fourth ventral suture. Body elongate-oval, probably apterous.

The single peculiar species from which the above characters are taken is closely allied to the genus *Menimus*, Sharp; but differs from it in having the antennæ 11-jointed, with a 4-jointed club, and also in the laterally projecting humeri and shorter legs. The eyes are excessively minute, smaller even than in *Menimus cæcus*, Sharp. The genus *Menimus* contains numerous representatives in New Zealand, and one in Japan.

Menimopsis excæcus, n. sp. (Plate I., figg. 17, 17*a*, ♀.)

Rather narrow and somewhat depressed, rufo-testaceous, shining, almost glabrous (probably clothed when fresh with scattered, long, fine, erect hairs, a few of which are visible upon the head and prothorax); the legs and antennæ testaceous. Head with widely scattered coarse punctures; antennæ with a few fine bristly hairs. Prothorax strongly transverse, about one-half wider than the head, moderately rounded at the sides, a little narrowed in front, the anterior angles obtuse, the hind angles subrectangular, the surface sparsely, coarsely punctate. Elytra parallel to near the middle and arcuately narrowing thence to the apex, the apices conjointly rounded; with rows of coarse punctures, which become finer at the apex, the interstices smooth and flat. Beneath very sparsely, coarsely punctate, the propleuræ smooth. Length 2¾, breadth 1 mm. (♀.)

Hab. St. Vincent—Morne-a-Garon, 1,200 feet.

One female example. Under rubbish on a damp rock in the forest (Smith).

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Echocerus.

Echocerus, Horn, Rev. Ten. of Am. north of M
p. 366 (1870).

Echocerus maxillosus.

Trogosita maxillosa, Fabr., Syst. Eleuth., i., p. 155.
Trogosita maxillaris, Beauv., Ins. Afr. et Amé
p. 125, t. 32, fig. 4.
Gnathocerus maxillosus, Lacord., Gen. Col., v., p. 32
nota; Woll., Ann. and Mag. Nat. Hist., 3rd ser
vi., p. 49; Col. Atlant. App., p. 61.
Echocerus maxillosus, Horn, Rev. Ten. of Am. nort
of Mex., p. 366; Champ., Biol. Centr.-Am., Col.
iv., 1, p. 146.

Hab. Grenada—Balthazar, on the Windward side.

Two examples of this cosmopolitan species, which is, no doubt, of American origin, were found by Mr. H. H. Smith in Grenada. It has already been recorded from the Antilles. Introduced into Europe, Madeira, and the Canary Is.

Iccius.

Iccius, Champion, Biol. Centr.-Am., Col., iv., 1, p. 147 (1886).

Iccius rufotestaceus, n. sp.

Elongate, narrow, flattened-cylindrical, shining, clear rufotestaceous, the elytra paler than the prothorax, the eyes black. Head sparsely, finely punctate; the sides of the front narrowly dilated, obliquely converging forwards, and impinging on the eyes behind, the latter large; the epistoma in one specimen with a small tubercle in the middle; antennæ short, widening outwards, joints 5–10 very strongly transverse, 11 short oval. Prothorax longitudinally convex, subquadrate, a little broader than long, slightly rounded at the sides in front, the angles obtuse; sparsely, finely punctate. Elytra of the same width as, and about two and one-fourth times the length of, the prothorax, parallel to beyond the middle, finely seriate-punctate, the interstices each with a row

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of exceedingly minute punctures. Anterior tibiæ widening outwards, sharply denticulate on their outer edge. Length 3–3¼, breadth ⅔–¾ mm.

Hab. St. Vincent—Leeward side.

Two specimens. This and the following species have quite the facies of a *Corticeus* (*Hypophlœus*), from which genus they may be known by the form of the anterior tibiæ and by the elytra completely covering the abdomen. In the typical species from Central America the mandibles are furnished with long erect horns in the male, as in *Gnathocerus*, *Echocerus*, etc. The insects here described are without these appendages, and they are probably all females.

Iccius grenadensis, n. sp.

Closely allied to *I. rufotestaceus*, and differing as follows :—The head shorter, the sides of the front narrower ; the epistoma limited behind by a deep transverse groove, terminating laterally in a rather deep fovea ; the antennæ with joints 6–10 very strongly transverse, 5 transverse but much narrower than 6. Prothorax shorter, much broader than long, and more finely punctured. Anterior tibiæ narrower, obsoletely denticulate on their outer edge. Length 2½, breadth ⅗ mm.

Hab. Grenada—Balthazar, on the Windward side.

One specimen, captured on the wing at sunset.

TRIBOLIUM.

Tribolium, Macleay, Ann. Javan., 1825, p. 47.

Tribolium ferrugineum.

Tenebrio ferrugineus, Fabr., Spec. Ins., i., p. 324 (1781).

Hab. St. Vincent ; Grenada.

The cosmopolitan insect generally known as *T. ferrugineum*, Fabr., has been recorded by MM. Fleutiaux and Sallé from Guadeloupe ; it is probable, however, that the Fabrician name has been wrongly applied.

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Arrhabæus.

Arrhabæus, Champion, Biol. Centr.-Am., Col., iv., 1, p. 144 (1886).

Arrhabæus debilis, n. sp.

Moderately convex, shining, piceous or castaneous, the antennæ ferruginous. Head coarsely punctured, deeply, transversely depressed in front, the sides of the front swollen and moderately prominent. Prothorax strongly transverse, about equal in width at the base and apex, the sides slightly rounded and sharply margined; coarsely, somewhat closely punctate. Elytra twice the length of the prothorax, arcuately narrowing from about the middle; coarsely and deeply punctate-sulcate, the interstices convex at the sides, flatter on the disc, and with a few very minute widely scattered punctures. Anterior and intermediate tibiæ rather coarsely denticulate on their outer edge, the anterior pair widening outwards.

♂. Head broader, with the sides of the front more dilated, oblique, and extending outwards nearly as far as the eyes.

Length 2½–3½, breadth 1–1⅕ mm. (♂ ♀.)

Hab. St. Vincent; Grenada—Balthazar, on the Windward side.

Numerous examples. This species is almost intermediate between *Arrhabæus*, Champ., and *Diœdus*, Lec. The type of the first-mentioned, *A. convexus*, Champ., from Costa Rica and Panama, has much stouter and more coarsely denticulate anterior tibiæ, and a very differently formed head. These characters, however, become much less marked in *A. guadeloupensis*, Fleut. and Sallé, and the present insect. In *Diœdus* the anterior tibiæ are rather narrow, and the sides of the front are not swollen. *A. debilis* is smaller and less convex than *A. guadeloupensis*, and it has the punctuation of the thorax and elytra much coarser. From *Diœdus punctatus*, Lec., an insect found under pine-bark in North America, it may be known by the prominent sides of the front and the wider anterior tibiæ. *A. guadeloupensis* and *A. debilis* would, perhaps, be almost equally well-placed in *Diœdus*. In rotten wood (Smith).

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ALEGORIA.

Alegoria, Castelnau, Hist. Nat. Ins. Col., ii., p. 221 (1840).

Alegoria dilatata.

Alegoria dilatata, Cast., *loc. cit.*, p. 221; F. Bates, Ent. Monthly Mag., ix., p. 182, nota; Champ., Biol. Centr.-Am., Col., iv., 1, p. 149.

Hab. St. Vincent—Windward side; Grenada—Balthazar and Windsor.

Numerous specimens. A widely-distributed species in Tropical America, ranging from Mexico to Peru, but not previously recorded from the Antilles. *A. castelnaui*, Fleut. and Sallé, from the Island of Guadeloupe, chiefly differs from it in having the punctures of the elytral striæ coarse and distant from each other. Found under the sheathing bases of decaying banana leaves, etc. (Smith).

ULOMA.

Uloma, Castelnau, Hist. Nat. Ins. Col., ii., p. 220 (1840).

Uloma sulcata, n. sp. (Plate I., fig. 4, ♂.)

Elongate, subparallel, convex, robust, castaneous or rufo-ferruginous, shining. Head very short, closely, finely punctate, transversely grooved in front; the antennæ short. Prothorax much broader than long, transversely convex, a little narrower in front than at the base, the sides rounded anteriorly and slightly converging behind, the angles obtuse; very finely and rather sparsely punctate, the punctuation a little closer towards the sides and apex, and with a shallow transverse groove (sometimes obsolete) before the base. Elytra two and one-half times the length of the prothorax, narrowing from about the middle; deeply crenate-striate, the punctures rather coarse, shallow, and somewhat distantly placed; the interstices strongly convex throughout and sparsely, minutely punctate; the humeri swollen and projecting in front; the epipleuræ extending to the apex. Fifth ventral segment deeply foveate in the middle before the apex.

♂. Anterior tibiæ broadly and abruptly widened on the inner side from about the basal third, concave beneath in their outer

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half, and with a dense fringe of short fulvous hairs extending from a little beyond the middle to the apex; intermediate tibiæ elongated, fully twice the length of the tarsi, and bowed inwards from near the base.

Length 7½–11, breadth 3½–4½ mm. (♂ ♀.)

Hab. St. Vincent—Kingstown, Windward side and Leeward side.

Ten specimens, varying greatly in size. In the large well-developed males the thorax is very convex and more rounded at the sides, and the anterior tibiæ are strongly dilated. Allied to *U. lævicollis*, Champ., from Central America; but differing from it (and from the European forms also) in the non-excavate disc of the thorax in the males, and also in the form of the tibiæ in this sex. The fifth ventral segment is foveate in the middle in both sexes. The variation in size and development of the males is almost as great as in some species of *Anisotomidæ*. The specimens of this and of the following species of the genus were found under bark or in rotten wood.

Uloma antillarum, n. sp.

Elongate, subparallel, convex, rufo-ferruginous, shining. Head short, closely, finely punctate, and with a very deep transverse groove in front; the antennæ short. Prothorax nearly one-half broader than long, a little narrower in front than at the base, the sides rounded anteriorly and slightly converging behind, the angles obtuse; sparsely, very finely, unequally punctate, with a narrow space down the middle impunctate, and with a shallow transverse groove before the base. Elytra narrowing from about the middle, deeply crenate-striate, the punctures rather coarse, shallow, and somewhat distantly placed, the interstices moderately convex, and with a few exceedingly minute scattered punctures, the humeri a little swollen in front. Fifth ventral segment deeply foveate in the middle before the apex.

♂. Anterior tibiæ broadly and abruptly widened on the inner side from about the basal third, concave beneath, and with a dense fringe of short fulvous hairs extending from a little beyond the middle to the apex; intermediate tibiæ bowed inwards from about the basal third.

Length 7½–8½, breadth 3¼–3⅔ mm. (♂ ♀.)

Hab. Grenada—Balthazar, on the Windward side.

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One male and two females. Closely allied to *U. sulcata*; but less robust, and also differing from it in the more transverse thorax, flatter elytral interstices, and more deeply grooved head. The male characters are similar. The fifth ventral segment is also foveate in both sexes.

Uloma grenadensis, n. sp.

Elongate, parallel, very convex, rufo-ferruginous, shining. Head very short, closely, finely punctate, transversely grooved in front; the antennæ short. Prothorax nearly one-half broader than long, a little narrower in front than at the base, the sides rounded anteriorly and slightly converging behind, the angles obtuse; sparsely, finely, unequally punctate, with a narrow space down the middle impunctate, and with indications of a shallow transverse groove before the base. Elytra narrowing from about the middle, finely crenate-striate, the punctures closely placed, the interstices flat on the disc, feebly convex towards the sides, and sparsely, minutely punctate, the humeri a little swollen in front. Fifth ventral segment deeply foveate in the middle before the apex.

♂. Anterior tibiæ widened on the inner side from about the basal third, concave beneath, and with a dense fringe of short fulvous hairs extending from a little beyond the middle to the apex; intermediate tibiæ bowed inwards from about the basal third; hind tibiæ feebly triangularly dilated on the inner side a little before the middle.

Length 7–8¼, breadth 3–3½ mm. (♂.)

Hab. Grenada—Black Forest Estate and Balthazar, on the Windward side.

Two males, one of which is considerably larger and broader than the other. Differs from *U. sulcata* and *U. antillarum* in the much more finely crenate-striate elytra, the punctures of the striæ closely placed, the interstices flat on the disc; the punctuation of the thorax is distinctly coarser, and the hind tibiæ in the male are feebly triangularly dilated on the inner side near the middle. The thorax is more transverse than in *U. sulcata*.

Uloma parvula, n. sp.

Moderately elongate, subparallel, convex, shining; rufous or ferruginous, the scutellum and elytra often fuscous or piceous, the elytra sometimes piceous with the suture and shoulders

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ferruginous. Head finely, rather sparsely punctate, transversely grooved in front; the antennæ moderately long. Prothorax about one-half broader than long, much narrower in front than at the base, the sides rounded anteriorly and slightly converging behind, the angles obtuse; sparsely, finely punctate, with a narrow space down the middle impunctate. Elytra two and one-half times the length of the prothorax, narrowing from the middle; rather coarsely crenate-striate, the striæ shallow, the punctures becoming coarser towards the sides and finer at the apex, and not very closely placed; the interstices feebly convex and sparsely, distinctly punctate; the epipleuræ extending to the apex. Fifth ventral segment unimpressed. Anterior tibiæ widening from the base, becoming very broad at the apex, finely denticulate on their outer edge, similar in both sexes.

♂. Head swollen on either side between the eyes, concave in the middle; prothorax with a broad and very deep transversely-cordate excavation on the anterior part of the disc, the excavation limited posteriorly by a transverse fold, which is slightly depressed in the centre.

Length 4¼–5¼, breadth 1¾–2¼ mm. (♂ ♀.)

Hab. St. Vincent—Windward side and Leeward side.

Apparently a common insect in the island of St. Vincent. Allied to *U. retusa*, Fabr., recorded by Fleutiaux and Sallé from Pointe-à-Pitre, Grande-Terre, but scarcely half the size of that insect, the thoracic excavation in the male deeper and differently shaped, the anterior tibiæ similar in both sexes. The colour of the elytra is as variable as in that species.

Alphitobius.

Alphitobius, Stephens, Ill. Brit., Mand., v., p. 11 (1832).

Alphitobius piceus.

Helops piceus, Oliv., Ent., iii., No. 58, p. 17, t. 2, figg. 13*a*, *b* (1795).

Alphitobius piceus, Champ., Biol. Centr.-Am., Col., iv., 1, p. 156; Fleut. et Sallé, Ann. Soc. Ent. Fr., 1889, p. 427.*

Hab. St. Vincent.

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* It is not necessary to give the rest of the synonymy here.

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Two specimens. A cosmopolitan species carried everywhere by commerce. Recorded from the islands of Guadeloupe and Grande-Terre. I have also seen an example of it from Antigua in the collection of the Rev. T. A. Marshall.

Doliema.

Doliema, Pascoe, Journ. Ent., i., p. 50 (1860); Champion, Biol. Centr.-Am., Col., iv., 1, p. 157.*
Schedarosus, Reitter, Col. Hefte, xv., p. 42.

Doliema plana.

Cucujus planus, Fabr., Syst. Eleuth., ii., p. 94.
Doliema plana, Champ., Biol. Centr.-Am., Col., iv., 1, pp. 157, 535*; Fleut. et Sallé, Ann. Soc. Ent. Fr., 1889, p. 428.†
Sitophagus lecontei, Horn, Rev. Ten. of Am. north of Mex., p. 346, t. 14, fig. 20 (♂).
Schedarosus scidarius, Reitt., Col. Hefte, xv., p. 44.
? *Adelina depressa*, Er., in Wiegm. Archiv, 1847, 1, p. 119.

Hab. Grenadines—Mustique I.

One female specimen. A widely distributed insect on the mainland of America, ranging from the Southern United States to Guiana. Also recorded from Cuba and Grande-Terre.

Zophobas.

Zophobas, Blanchard, Hist. des Ins., ii., p. 15 (1845); Champion, Biol. Centr.-Am., Col., iv., 1, p. 103.

Zophobas morio.

Helops morio, Fabr., Gen. Ins. Mant., p. 241, No. 45 (1777); Spec. Ins., i., p. 325; Mant. Ins., i., p. 214; Ent. Syst., i., p. 120; Syst. Eleuth., i., p. 160.

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* For the rest of the synonymy, see Champ., *op. cit.*
† *D.* (*Pytho*) *pallida*, Say, is incorrectly given as a synonym by these authors.

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Zophobas morio, Kraatz, Deutsche ent. Zeit., 1880, p. 128; Champ., Biol. Centr.-Am., Col., iv., 1, pp. 104, 522; Fleut. et Sallé, Ann. Soc. Ent. Fr., 1839, p. 427.

Helops elongatus, Beauv., Ins. Afr. et Amér., p. 164, t. 31, fig. 9; Chevr., Ann. Soc. Ent. Fr., 1852, p. 638.

Helops nigritus, Oliv., Ent., iii., No. 57, p. 5, t. 2, figg. 26*a*, *b*.

Zophobas concolor, Woll., Ann. and Mag. Nat. Hist., 1870, v., p. 33; Col. Sanctæ Helenæ, p. 234.

Hab. St. Vincent.

Three specimens, all females, with the elytral interstices a little more convex than usual. Recorded by Fleutiaux and Sallé, from the islands of Guadeloupe, Grande-Terre, and Les Saintes. I have also seen specimens of it from Dominica and Trinidad in the collection of the Rev. T. A. Marshall. Introduced into St. Helena. It seems to be almost cosmopolitan.

Zophobas laticollis.

Zophobas laticollis, Motsch., Bull. Mosc., xlv., 2, pp. 35, 36 (1872); Kraatz, Deutsche ent. Zeit., 1880, p. 131; Champ., Biol. Centr.-Am., Col., iv., 1, pp. 105, 522, t. 5, fig. 14 (♂).

Hab. Grenada—Balthazar, on the Windward side.

One female example.

ANÆDUS.

Anædus, Blanchard, Hist. des Ins., ii. p. 35 (1845).
Anædus, Lacordaire, Gen. Col., v., p. 396.

Anædus quadrinotatus, n. sp.

Oblong oval, shining, piceous or reddish-brown, with a slight brassy lustre; the elytra each with a large spot at the shoulder and another at about one-third from the apex, the latter sometimes obsolete, rufous or testaceous; the antennæ pitchy-brown, with the basal two joints, and also the apical one, ferruginous; the palpi and legs rufo-testaceous, the femora sometimes infuscate;

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the upper surface clothed with fine, semi-erect hairs. Head with a few scattered coarse, deep punctures, deeply, transversely grooved in front; antennæ moderately long, stout, thickening a little outwardly, joint 2 very short, 3 nearly twice as long as 2, 4 longer and stouter than 3, 4–10 subequal in length, about as broad as long, 11 much longer and stouter than 10. Prothorax short, transversely convex, constricted behind, the sides angularly dilated at the middle and also subangulate near the apex, the anterior angles rounded, the hind angles acutely rectangular; the surface exceedingly coarsely and somewhat closely punctate. Elytra about three times the length of, and much wider than, the prothorax, subparallel or slightly widening to the middle and narrowing thence to the apex, a little flattened on the disc, very coarsely and thickly punctured, the punctures subserially arranged towards the suture. Length 2¾–3½, breadth 1⅓–1½ mm. (♂ ♀.)

Hab. St. Vincent—Leeward side; Grenada—Grand Etang and Balthazar, on the Windward side, and Mount Gay Estate, on the Leeward side.

Nine specimens. This small species is allied to *A. maculatus*, Champ., from Chiriqui. The elytral spots are not always distinct, the posterior one sometimes obsolete. The genus has apparently not been previously recorded from the Antilles.* The tibiæ are unarmed in the male. Under leaves, etc.; also attracted to "light" (Smith).

Paratenetus.

Paratenetus, Spinola, Essai Monogr. Clérites, ii., p. 116 (1844); Champion, Biol. Centr.-Am., Col., iv., 1, pp. 238, 544.

Storthephora, Mäklin, Act. Soc. Fenn., x, pp. 635, 658 (1875).

Paratenetus punctulatus.

Paratenetus punctulatus, Champ., *op. cit.*, p. 545.

Hab. Grenada—Woburn, south end.

One specimen, probably belonging to this species. The genus has not previously been recorded from the Antilles. In dry scrubby growth, on foliage (Smith).

* *A. delaunéyi*, Fleut. & Sallé, from Guadeloupe, the type of which I have examined, is a Cistelid, and belongs to the genus *Lystronychus*, Latr.

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Cyrtosoma.

Cyrtosoma, Perty, Del. Anim. artic. Bras., p. 59 (1830).

Cyrtosoma herminieri.

Cnodalon l'herminierii, Chevr. in Guérin's Icon. Règne Anim., Ins., p. 123, t. 31, figg. 10, 10*a*, *b* (*C. atrum*).

Cyrtosoma l'herminieri, Fleut. et Sallé, Ann. Soc. Ent. Fr., 1889, p. 428.

Hab. St. Vincent—Leeward side; Grenada—Balthazar and La Force Estate, on the Windward side.

Several examples from each locality. Original recorded by Chevrolat from Pointe-à-Pitre, Grande-Terre I., and subsequently by Fleutiaux and Sallé from Guadeloupe I. In dry second-growth woods, beaten from vines and bushes, also under bark of a rotten log (Smith).

Blapida.

Blapida, Perty, Del. Anim. artic. Bras., p. 58 (1830).

Blapida castaneipennis, n. sp.

Obscure reddish-brown, the head, palpi, antennæ, and legs, and the lateral, basal, and apical margins of the prothorax, black; the head and prothorax dull or feebly shining, the elytra shining; beneath darker than above, the prosternum black, the ventral surface piceous. Head sparsely, very irregularly, minutely punctate. Prothorax transverse, gradually narrowing from about the basal third to the apex, parallel behind, the anterior angles rounded; very sparsely, minutely punctate. Elytra elongate, broad, gibbous towards the base, and with the disc flattened and gradually declivous thence to the apex, the apex of each elytron very sharply mucronate; very deeply striate throughout, the striæ finely punctured, the 3rd and 6th near the apex, and the 4th and 5th, and also the 7th and 8th, at some distance before this, coalescent; the interstices smooth and convex. Beneath almost smooth. Intermediate tibiæ widened on the inner side at the apex. Length 22–23, breadth 7½–8 mm. (♂).

Hab. Grenada—Balthazar, on the Windward side.

Two examples. A female of the same species is contained in the British Museum; this was found in the

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island of Trinidad by Mr. Broadway. Allied to *B. neotropicalis*, Champ., from Central America, but larger and differently coloured, the thorax more narrowed in front, the elytral striæ more finely punctured and the interstices more convex. *B. pertyi*, Cast., from Brazil, is also an allied form. On fire-wood, and also attracted to "light" (Smith).

Acropteron.

Acropteron, Perty, Del. Anim. artic. Bras., p. 64 (1830).

Acropteron quadraticolle, n. sp.

Very elongate, narrow, convex, shining, brownish-bronze. Head thickly, unequally punctate, the epistoma smoother, transversely grooved in front. Prothorax convex, nearly one-half broader than long, completely margined at the base, the sides feebly sinuate—almost straight when viewed from above; the anterior angles very prominent but rather obtuse, the hind angles acute; the surface somewhat thickly, moderately finely punctate, a narrow space down the centre excepted, and feebly transversely grooved in the middle before the base. Elytra about five and one-third times the length of the prothorax, gradually narrowing for about three-fourths of their length, and thence rapidly converging to the apex, the apices sharply mucronate and divaricate; rather coarsely seriate-punctate; the interstices smooth, almost flat on the disc, convex at the sides and apex. Posterior tibiæ similar in both sexes. *Length* 15–16½, breadth 2½–2⅔ mm. (♂ ♀.)

Hab. St. Vincent—Leeward side; Grenada—Grand Etang, alt. 1,900 feet, and Balthazar, both on the Windward side.

Four specimens. Allied to *A. puncticolle*, Champ., from Chiriqui, but differing from it in the broader and sharply transversely-quadrate thorax, the sides of which are almost straight, and the angles very prominent; the head and thorax are also much more sparsely punctured. From *A. chabrieri*, Fleut. and Sallé, from Guadeloupe I., it may be known by the divaricate and sharply mucronate apices of the elytra, and the prominent anterior angles of the thorax. The posterior tibiæ are simple in the male. On foliage (Smith).

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Mentes.

Mentes, Champion, Biol. Centr.-Am., Col., iv., p. 559 (1893).

Mentes æneopiceus, n. sp. (Plate I., fig. 8, ♂.)

Elongate oval, very narrow, feebly convex, subopaque; pitchy-black, with a greenish-æneous lustre, the antennæ brown, the legs ferruginous, with the apical halves of the femora infuscate. Head very sparsely, finely punctate; the eyes very large, narrowly separated in front; antennæ about half the length of the body, rather slender, joints 1–3 very short, 3 slightly longer than 2, 4–11 moderately elongate, obconic, subequal in length, 4 stouter than, and more than twice as long as, 2. Prothorax strongly transverse, much wider than the head, slightly narrowed in front, rounded at the sides, transversely grooved before the base, the groove ending on either side in a deep fovea, which does not reach the basal margin, the disc also feebly transversely depressed in the middle; the surface sparsely, finely punctate, with a narrow smooth space down the middle. Elytra elongate, depressed, a little wider than the prothorax, narrowing from the middle; finely and rather irregularly punctate-striate, the punctures closely packed; the interstices almost flat, each with an irregular row of punctures, which are closely placed and very little finer than those of the striæ. Legs elongate, slender; the hind pair with the tarsi nearly as long as the tibiæ, and the basal joint of the tarsi as long as the following joints united; the anterior tarsi slender and quite simple. Length 5½, breadth 1¾ mm. (♂.)

Hab. Grenadines—Mustique I.

One male example. Allied to *M. fusiformis*, Champ., from Guatemala.

Talanus.

Talanus, Jacquelin Duval, in Sagra's Hist. Cuba, vii., Ins., p. 66 (1856); Mäklin, Öfv. Finsk. Vet.-Soc. Förh., xx., p. 95 (1878); Champion, Biol. Centr.-Am., Col., iv., 1, p. 321.

Dignamptus, Leconte, Proc. Amer. Phil. Soc., xvii., p. 421 (1877).

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Talanus cribrarius.

Talanus cribrarius, Jacq. Duv., in Sagra's Hist. Cuba, vii., Ins., p. 66; Mäkl., Öfv. Finsk. Vet.-Soc. Förh., xx., p. 97.

Hab. Grenada—Woodford Estate, on the Leeward side.

A single male specimen, agreeing with one from Cuba in Mr. F. Bates's collection. It has a short sharp tooth on the inner side of each of the tibiæ a little beyond the middle. Scrubby hill-sides, on herbage (Smith).

Talanus insularis.

Talanus insularis, Mäkl., Öfv. Finsk. Vet.-Soc. Förh., xx., p. 98.

Hab. Grenada—Mount Gay Estate, on the Leeward side, and Balthazar, on the Windward side.

Three specimens (♂ ♀), probably belonging to this species. They are less elongate and much smaller than *T. cribrarius*; the legs and antennæ are shorter, the latter with joints 9 and 10 strongly transverse (nearly as long as broad in *T. cribrarius*); and the elytra are more distinctly striate, with the punctures coarser. The male-characters are similar. Mäklin's types were from Puerto Rico. Beaten from vines and bushes (Smith).

Talanus ferrugineus, n. sp.

Elongate oval, convex, ferruginous, shining. Head closely, finely punctate, the epistoma smoother, deeply, transversely grooved in front; antennæ short, thickening outwardly, joints 7–10 strongly transverse, 11 oval, stouter than, and more than twice as long as, 10. Prothorax about as long as broad, the sides rounded in front and sinuate behind, sharply margined; thickly, moderately finely punctate, a space along the middle more sparsely punctured; transversely grooved before the base. Elytra moderately long, about twice as wide as the prothorax, gradually widening to a little beyond the middle and rapidly narrowing thence to the apex; deeply striate, the striæ with oval, coarse punctures, the sutural stria very deeply impressed; the interstices smooth and convex.

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♂. Anterior tibiæ armed with a sharp triangular tooth on the inner side a little beyond the middle.

Length 6–6½, breadth 2¼–2⅜ mm. (♂ ♀.)

Hab. St. Vincent; Grenada—Balthazar, and Chantilly Estate, on the Windward side.

Six specimens. Allied to *T. guadeloupensis*, Fleut. and Sallé (the types, ♀, of which are before me), but entirely ferruginous in colour, the thorax with a rather deep transverse groove before the base, the antennæ with joints 8–10 more strongly transverse. From *T. subexaratus*, Mäkl., from Central and South America, it may be known by its more robust build, more oval elytra, and ferruginous colour, and also in having the tooth on the anterior tibiæ placed nearer the middle in the males, the tooth on the intermediate pair being obsolete. Beaten from vines and brush; also attracted to "light" (Smith).

Talanus lævicollis, n. sp.

Elongate, subparallel, convex, subopaque; black, piceous, or fuscous, the legs reddish-brown in light-coloured examples, the antennæ and palpi ferruginous. Head sparsely, very minutely punctate, deeply transversely grooved in front; antennæ short, thickening outwardly, joints 8–10 transverse, wider than 7, 11 oval, stout. Prothorax a little longer than broad, the sides rounded in front and sinuate behind, sharply margined; sparsely, minutely punctate, almost smooth at the sides, and with a short oblique groove on either side of the middle before the base. Elytra moderately elongate, one-half wider than the prothorax, subparallel to about the middle and rapidly narrowing thence to the apex; sharply punctate-striate, the striæ with oval rather coarse punctures which become finer towards the apex, the sutural stria very deeply impressed; the interstices smooth and feebly convex.

♂. The tibiæ each armed with a short triangular tooth on the inner side near the apex.

Length 5¼–7½, breadth 1¾–2⅛ mm. (♂ ♀.)

Hab. St. Vincent; Grenada—Balthazar, and Chantilly Estate on the Windward side, Windsor.

Numerous examples of both sexes. This species differs from all the allied forms in its dull, and sparsely, minutely punctured thorax. Beaten from vines, bushes, and dry banana leaves (Smith).

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CISTELIDÆ.

LOBOPODA.

Lobopoda, Solier, Ann. Soc. Ent. Fr., 1835, p. 233.

Lobopoda insularis, n. sp. (Plate I., figg. 10, ♂; 10*a*, genitalia.)

♂. Elongate, rather broad, black, shining, clothed with scattered hairs; the tibiæ pitchy-brown, the tarsi ferruginous; the antennæ ferruginous, with the five basal joints partly piceous. Head sparsely, finely punctate; the eyes very large, approximate in front; antennæ about half the length of the body. Prothorax strongly transverse, a little narrowed in front, the sides rounded anteriorly and almost parallel behind; the surface sparsely, finely punctate, obsoletely canaliculate down the middle, transversely depressed in the centre before the base, and with deep basal foveæ. Elytra elongate, a little wider than the prothorax, gradually narrowing from about the middle to the apex, the apices rounded; deeply crenate-striate, the punctures moderately coarse; the interstices feebly convex, very sparsely, finely punctate. Legs elongate; tibiæ roughly punctured, the anterior pair gradually widened on the inner side to a little beyond the middle, and then abruptly narrowed and concave to the apex (appearing broadly subangularly dilated), the hind pair slightly curved; anterior tarsi with joints 1–4, and the intermediate tarsi with joint 4, broadly lobed beneath. Genitalia: the lateral lobes slender and moderately long, curved inwards, slightly tapering at the tip, and fringed with long hairs beneath; the central sheath very long and stout, abruptly narrowed at some distance before the apex, the apex truncate. Length 9¾, breadth 3½ mm.

Hab. Grenadines—Mustique I.

One specimen. More elongate and more parallel than *L. tarsalis*, Fleut. and Sallé, from Guadeloupe Island, the thorax more sparsely punctured, more shining, and distinctly narrower than the elytra. The anterior tarsi have the four basal joints lobed beneath. Amongst the Central-American species it perhaps approaches nearest to *L. oblonga* from Yucatan.

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Lobopoda ebenina, n. sp. (Plate I., fig. 11, ♂, genitalia.)

♂. Elongate, somewhat fusiform, convex, deep black, very shining, clothed with a few scattered hairs; the palpi and tarsi, the apical joint of the antennæ, and the apices of the preceding joints, ferruginous. Head sparsely, finely punctate; the eyes very large, approximate in front; antennæ about half the length of the body. Prothorax strongly transverse, a little narrowed in front, the sides rounded anteriorly and almost parallel behind; the surface very sparsely and somewhat coarsely punctate, transversely depressed in the middle before the base, and with the basal foveæ sharply defined. Elytra not wider than the prothorax, moderately elongate, rapidly narrowing from about the middle, and rounded at the apex; coarsely and deeply crenate-striate, the punctures closely placed; the interstices convex, sparsely, finely punctate. Legs rather short; anterior and intermediate tarsi stout, with joints 1–4 broadly lobed beneath; anterior tibiæ sub-triangularly widened on the inner side before the middle. Genitalia: the lateral lobes moderately long, rather narrow, and abruptly curved inwards at the apex, the apices obtuse; the central sheath gradually narrowing outwards. Length 8½, breadth 3 mm.

Hab. Grenada—Soubise, on the Windward side.

One abraded specimen. Amongst the numerous Central-American species of *Lobopoda* described by myself, *L. ebenina* is perhaps nearest allied to *L. tristis*; but it is much smaller and more shining, with less elongate limbs, the thorax almost parallel behind, and the genitalia in the male very differently formed. In the shore-woods (Smith).

LYSTRONYCHUS.

Lystronichus, Latreille, Règne Anim., 2nd edit., v., p. 41 (1829).
Lystronychus, Lacordaire, Gen. Col., v., p. 514.

Lystronychus tuberculifer, n. sp.

Oval, convex, slightly shining, dark bronze; the elytra obscure reddish-brown with an æneous lustre, with a transverse rufous patch on the outer part of the disc—in one specimen reduced to a marginal spot—a little below the base; the antennæ cyaneous; the upper surface with widely scattered, long, erect, bristly, black

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hairs, which are serially arranged on the elytra. Head densely, rugosely punctured; the eyes coarsely granulated, rather large, separated by a space not equalling the width of one of the eyes as seen from above; antennæ scarcely half the length of the body, the joints from the fourth compressed, becoming much broader outwards, 3 shorter than 4, 7–10 about as broad as long. Prothorax transversely convex, nearly one-half broader than long, bisinuate at the base, rounded at the sides, the latter armed with two blunt teeth before the middle and two acute teeth behind the middle, and strongly constricted behind, the hind angles acute; the surface closely, rather coarsely punctate. Elytra much wider than, and about three and one-half times the length of, the prothorax, rapidly narrowing from a little beyond the middle; rather finely seriate-punctate, the punctures closely placed; the interstices flat, the alternate ones each with a row of scattered tubercular elevations, the others also with two or three similar elevations towards the apex, and a few widely scattered serially arranged punctures, the elevations each followed by a setiferous puncture. Length 7½–8, breadth 3¼ mm.

Hab. Grenada—Balthazar, on the Windward side.

Two specimens, both attracted to "light." In the form of the head and thorax this insect approaches *L.* (*Anædus*) *delauneyi*, Fleut. and Sallé, from Guadeloupe Island; but the antennæ (instead of being subfiliform) have the joints from the fourth compressed and widened. *L. scapularis*, Champ., from Central America, is also an allied species. The form of the antennæ resembles that of *Xystropus*, except that the third joint is shorter (not longer) than the fourth.

Lystronychus rufonotatus, n. sp.

Oblong oval, broad, subopaque, piceous, with a faint æneous lustre, the elytra with an interrupted transverse rufous patch on the outer part of the disc a little below the base, the legs reddish-brown, the antennæ with joints 5–11 cyaneous; the upper surface with widely scattered, long, erect, black, bristly hairs, which are serially arranged on the elytra. Head densely, rugosely punctured; the eyes coarsely granulated, rather large, separated by a space equalling the width of one of the eyes as seen from above; antennæ scarcely half the length of the body, the joints from the fourth compressed, becoming broader outwards, 3 shorter than 4, 5–10 a little longer than broad. Prothorax transversely convex,

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much broader than long, bisinuate at the base, rounded at the sides, the latter strongly constricted behind, and armed with four short blunt teeth, the hind angles acute; the surface densely, rather coarsely punctate. Elytra one-half wider than, and nearly four times the length of, the prothorax, subparallel to the middle, and rapidly narrowing thence to the apex; rather finely seriate-punctate, the punctures closely placed; the interstices flat, each with a series of slightly finer, more scattered punctures, the alternate ones also with a series of widely separated tubercular elevations. Length 9, breadth 3½ mm.

Hab. St. Vincent—Chateaubelais.

One specimen. Larger, duller, and more elongate than *L. tuberculifer*; the antennæ less dilated, and with joints 5–10 longer than broad; the thorax more densely punctured, with the marginal teeth more obtuse; the elytral interstices each side with a row of punctures extending from the base to the apex, the tubercular elevations fewer in number and less raised.

LAGRIIDÆ.

Statira.

Statira, Lepel. de St. Fargeau et Serville, Encycl. Méth., x., p. 479 (1825).

Statira antillarum, n. sp.

Moderately elongate, shining, piceous, the head and prothorax sometimes pitchy-red, the basal half of the femora rufo-testaceous, the tarsi brownish. Head almost smooth; the eyes large, coarsely granulated, separated by a space nearly equalling the width of one of the eyes as seen from above; antennæ scarcely half the length of the body, the apical joint nearly as long as joints 6–10 united, very little shorter in the female. Prothorax as long as broad, rounded at the sides, almost smooth. Elytra moderately elongate, a little more than twice the width of the prothorax, gradually widening to the middle and rapidly narrowing thence to the apex, the apices sharp and divaricate; finely punctate-striate, the punctures closely placed; the interstices rather convex, the first, third, fifth, seventh, and ninth each with about ten or twelve deep setiferous punctures, the setæ very long and erect. Tibiæ sulcate on their outer edge.

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Var. Rufo-ferruginous or rufo-testaceous; the legs brown or obscure testaceous, with the basal half of the femora testaceous.

Length 6½–7¾, breadth 2½–2¾ mm. (♂ ♀.)

Hab. St. Vincent—Leeward and Windward sides; Grenada—Mount Gay and Vendome Estates, on the Leeward side, Balthazar, on the Windward side; Grenadines—Mustique I.

Numerous specimens of the dark form from Grenada and Mustique; two of the pale variety from St. Vincent. Allied to *S. asperata*, Champ., from the Isthmus of Panama; but with a shorter apical joint to the antennæ in the male, the femora with their basal half pale, and the elytra more deeply punctate-striate, the setiferous impressions not preceded by a tubercle. The setiferous punctures vary in number and position. *S. fulva*, Fleut. and Sallé, from Guadeloupe I., has ungrooved tibiæ, and also differs in other respects from the present insect. Beaten from vines, herbage, etc.; also attracted to "light" (Smith).

Statira vittata, n. sp. (Plate I., fig. 9, ♂.)

Moderately elongate, faintly shining; testaceous, the eyes and the elytra black, the latter each with a very broad, slightly oblique, flavo-testaceous stripe on the disc—extending from the base to near the apex, and nearly or quite reaching the suture behind. Head almost smooth; the eyes large, coarsely granulated, separated by a space nearly equalling the width of one of the eyes as seen from above; antennæ moderately long in the male, a little shorter in the female, the apical joint in both sexes slightly longer than 9 and 10 united. Prothorax a little wider than the head, as broad as long, rounded at the sides, sharply margined at the base, and with acute hind angles; the surface with a few scattered very minute punctures. Elytra moderately elongate, rapidly narrowing from a little beyond the middle; finely punctate-striate, the punctures closely placed; the interstices rather convex, the third with about eight, the fifth with three or four, the seventh with one (at the shoulder), and the ninth with three or four (towards the apex), setiferous punctures. Length 6½–8¼, breadth 2–2½ mm. (♂ ♀.)

Hab. St. Vincent—Leeward side; Grenadines—Mustique I.

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Numerous examples. Allied to *S. conspicillata* and *S. pulchella*, Mäkl., from Central America, but very differently coloured. The thorax is without marginal carina, and the tibiæ are ungrooved on their outer edge. There is very little difference in the form of the antennæ in the sexes, those of the female being merely a little shorter.

PYTHIDÆ.

Sosthenes.

Sosthenes, Champion, Biol. Centr.-Am., Col., iv, 2, p. 106 (1889).

Sosthenes parvulus, n. sp.

Moderately elongate, rather depressed, very shining, glabrous; greenish-æneous, the humeri indeterminately brownish, the labrum, oral organs, legs, and antennæ testaceous, the latter with the apical three joints piceous. Head very broad and short, sparsely, finely punctate; the eyes prominent, coarsely granulated; antennæ short, scarcely reaching the base of the prothorax, slender, the apical three joints widened and forming a loose club, 9 and 10 transverse. Prothorax as wide as the head including the eyes, transversely cordate, much narrower at the base than at the apex; somewhat coarsely and moderately closely punctate, the punctures becoming coarser and more crowded at the sides. Elytra a little more than twice the length of the prothorax, and slightly wider than it, truncate in front, subparallel to the middle and arcuately narrowing thence to the apex, deeply transversely depressed below the base, the basal portion, except along the suture, appearing transversely swollen; finely punctate to a little beyond the middle, the punctuation close and confusedly arranged near the suture, becoming denser at the base, scattered and subseriately arranged towards the sides, and completely obsolete on the declivous apical portion. Beneath with scattered punctures on the abdomen and metasternum, those on the latter coarse, the prosternum and propleuræ very coarsely punctured. Length 1½ mm.

Hab. Grenada—Grand Etang, on the Windward side, 1,900 feet.

A single specimen. In its structural characters this minute species agrees with the type of the genus, *S. dychirioides*, Champ., from Guatemala, from which it

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differs in its depressed form, more prominent eyes, more slender antennæ, etc. The elytra have a deep transverse depression below the base, as in various species of *Salpingus*, *Anthicus*, etc. An allied undescribed form from Guadeloupe is contained in the collection of M. Fleutiaux of Paris. Beaten from bushes in the forest (Smith).

ŒDEMERIDÆ.

Oxacis.

Oxacis, Leconte, New Sp. Col., p. 165 (April, 1866).
Hypaxclera, Kirsch, Berl. ent. Zeitschr., xxx., p. 210 (July, 1866).

Oxacis simplex.

Copidita simplex, C. O. Waterh., Trans. Ent. Soc. Lond., 1878, p. 308.

Hab. St. Vincent—Windward side; Grenadines—Mustique I.

Six examples. The punctuation of the upper surface is exceedingly fine and close, and the pubescence is fine and silky. The claws are angularly dilated within. The left mandible is pointed at the tip, and the right mandible is toothed on the upper side before the apex. The antennæ vary in colour from testaceous to piceous, the two basal joints being always pale. Specimens of this species have also been collected in the island of Antigua, by the Rev. T. A. Marshall. The type was from St. Bartholomew.

Oxacis antillarum, n. sp.

Moderately elongate, rather broad, shining; testaceous, the head with a broad stripe down the middle, the prothorax with a median line, not reaching the base or apex, and the tips of the mandibles, piceous, the eyes black; the antennæ fusco-testaceous, the two basal joints flavous; the elytra fusco-piceous with a bluish lustre, with a broad sutural stripe, abruptly narrowed at the base, and the lateral margin very narrowly, flavous; the abdomen in great part piceous, testaceous at the base; above and beneath rather sparsely clothed with fine yellowish-cinereous pubescence. Head thickly

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punctured, the eyes very large; (antennæ with joints 6–11 broken off). Prothorax wider than the head, subcordate, closely and rather coarsely punctate, with a longitudinal median carina towards the apex, this being replaced behind by a smooth narrow space, the disc depressed on either side before the middle. Elytra moderately long, one-half wider than the prothorax, closely and finely punctate, and with two faint costæ on the disc. Legs stout; claws angularly dilated within. Length 9¼, breadth 2½ mm. (♀.)

Hab. St. Vincent—Chateaubelais.

This insect resembles *O. simplex* in colour, except that the head is infuscate along the middle, and the thorax has a dark median line; it is, however, more shining and much more distinctly punctured, the punctures on the thorax being rather coarse, and the pubescence is coarser. The mandibles are long, slender, and simple, pointed at the tip.

Copidita.

Copidita, Leconte, New Sp. Col., p. 164 (1866); Leconte & Horn, Class. Col. N. Am., p. 405.

Copidita costata, n. sp.

Elongate, rather broad, subopaque; testaceous, the eyes and the tips of the mandibles black, the elytra with a broad submarginal pale brownish stripe extending from the base to the apex; above and beneath finely pubescent. Head thickly, finely punctate; (antennæ broken off). Prothorax slightly wider than the head, subcordate, about as broad as long, closely, finely, very distinctly punctate, the disc flattened in the centre before the base, and also depressed on either side before the middle. Elytra moderately elongate, nearly twice as wide as the prothorax, closely, shallowly, very finely punctate, and with four well-defined costæ—the third abbreviated in front and behind, and the second and fourth almost confluent behind—the suture also raised and costiform. Legs stout. Length 10½, breadth 2¾ mm. (♀.)

Hab. ? St. Vincent.

A single mutilated example of this species is contained in Mr. Smith's Antillean collections. It is, unfortunately, not labelled with the exact locality, but is probably from his first collection made at St. Vincent. The elytral costæ are unusually well-defined. The left mandible is truncate and scarcely emarginate; the right mandible is bifid at the tip.

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Copidita lateralis.

Copidita lateralis, C. O. Waterh., Trans. Ent. Soc. Lond., 1878, p. 307.

Hab. Grenada—Mount Gay Estate, on the Leeward side; Grenadines—Mustique I.

One specimen from each locality. The insect was described originally from San Domingo and Jamaica. Attracted to "light" (Smith).

Copidita tenella.

Copidita tenella, C. O. Waterh., Trans. Ent. Soc. Lond., 1878, p. 307.

Hab. St. Vincent—Windward side.

One specimen. Described from the island of St. Thomas. The mandibles are feebly bifid at the tip.

Copidita quadrilineata, n. sp. (Plate I., fig. 12.)

Moderately elongate, rather narrow, subopaque; pale flavous, the eyes black; the elytra slate-coloured, with the sutural and lateral margins, the first costa from a little below the base to near the middle, and the second costa from the base to near the apex, flavous; the antennæ black, with the basal joint obscure testaceous, the palpi and the tips of the mandibles fuscous, the legs pale flavous, with the tarsi and the apices of the tibiæ infuscate; above and beneath rather sparsely clothed with fine yellowish-cinereous pubescence. Head thickly punctured; antennæ more than half the length of the body. Prothorax longer than broad, subcordate, parallel behind, the anterior part as wide as the head, closely, very finely punctate, the disc depressed in the middle at the base and also on either side anteriorly. Elytra moderately elongate, more than one-half wider than the prothorax, densely, subrugosely punctured, and with three distinct costæ—two on the disc and one close to the lateral margin, the latter rather prominent. Legs rather stout. Length 7, breadth 1¾ mm.

Hab. St. Vincent.

One specimen only, probably a male, of this well-marked species has been received. The two outer costæ of the elytra are more distinct than in the allied forms, *C. frontalis*, etc. The thorax is somewhat abruptly narrowed about the middle and parallel thence to the base, the anterior half being rounded at the sides.

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Copidita frontalis, n. sp. (Plate I., fig. 13.)

Moderately elongate, narrow, the head and prothorax shining, the elytra opaque; brownish-black, the anterior half of the head, the prothorax, and the sutural and lateral margins of the elytra to near the apex, the former rather broadly, flavous or flavo-testaceous; the legs flavo-testaceous, the tarsi, the base of the first joint excepted, and the apices of the tibiæ, infuscate; the antennæ black, with the base of the first joint testaceous; finely pubescent, the pubescence partaking of the ground colour. Head closely, very finely punctate; antennæ more than half the length of the body. Prothorax subcordate, longer than broad, a little narrower than the head, closely, very finely punctate; the disc depressed on either side before the middle, and flattened in the centre before the base. Elytra moderately elongate, nearly twice the width of the prothorax, densely, subrugosely punctured, and with indications of three faint costæ on the disc. Legs moderately slender. Length 6, breadth 1½ mm.

Hab. St. Vincent—Leeward and Windward sides.

Two examples, probably males. The sutural and lateral margins of the elytra are of a paler yellow than the prothorax.

Copidita grenadensis, n. sp.

Moderately elongate, narrow, the head and prothorax shining, the elytra opaque; black, the anterior half of the head, the front coxæ, the prothorax, and the sutural and lateral margins of the elytra to near the apex, very narrowly, flavous; finely pubescent, the pubescence partaking of the ground colour. Head comparatively short, closely, finely punctate; antennæ rather slender, a little more than half the length of the body. Prothorax scarcely narrower than the head, about as long as broad, subcordate, slightly depressed on either side of the disc before the middle, closely, finely punctate, smoother in the centre. Elytra moderately elongate, one-half wider than the prothorax, densely, subrugosely punctured, with indications of three faint costæ on the disc, the inner one short. Legs slender. Length 5½, breadth 1½ mm.

Hab. Grenada—Mount Gay Estate, on the Leeward side.

One specimen, probably a male. This small species is allied to *C. frontalis*, but differs from it in having the

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legs black and more slender, the thorax shorter, wider, and less densely punctured. Found on the wing at sunset (Smith).

XYLOPHILIDÆ.

Xylophilus.

Xylophilus, Latreille, Fam. Nat. du Règne Anim., p. 383 (1825).

This genus has not hitherto been recorded from the Antilles or South America.

Xylophilus trifasciatus.

Xylophilus trifasciatus, Champ., Biol. Centr.-Am., Col., iv., 2, p. 171, t. 8, fig. 4.

Hab. Grenada—St. George's, on the Leeward side.

One female specimen, differing from those from Central America in having the two basal joints only of the antennæ infuscate.

Xylophilus æquinoctialis.

Xylophilus æquinoctialis, Champ., *loc. cit.*, p. 180, t. 8, fig. 15.

Hab. St. Vincent—Balthazar, on the Windward side, St. John's River, on the Leeward side.

Numerous examples. Apparently a widely distributed Tropical-American insect, ranging from the Mexican State of Vera Cruz to Panama, and probably further south. Beaten from bushes, also flying (Smith).

Xylophilus nigricollis, n. sp. (Plate I., fig. 14, ♂.*)

♂. Oval, rather narrow, moderately convex, shining; the head and prothorax black; the elytra testaceous, with a rather broad black median fascia, which is widened outwards and extends forwards along the lateral margin, the fascia in one specimen interrupted at the suture, the suture itself narrowly infuscate; the antennæ testaceous, with the basal joint piceous; the legs testaceous,

* The minute penultimate tarsal joint cannot be shown in the figures of this and the following species.

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the hind femora in great part piceous; the upper surface sparsely clothed with rather long, decumbent, yellowish-cinereous hairs. Head broad, sparsely, finely punctate, very narrowly extended on either side behind the eyes; the latter large, coarsely granulated, and very narrowly separated in front; the antennæ moderately long, rather stout, joint 1 elongate, 2 short, transverse, 3–10 gradually decreasing in length and increasing in width, 3 twice as long as 2, 9 and 10 about as broad as long, 11 long and stout, obliquely truncate and acuminate at the apex. Prothorax subquadrate, a little narrowed in front, slightly broader than long, narrower than the head, thickly, moderately finely punctate. Elytra short, oval, nearly twice as wide as the prothorax, thickly, somewhat coarsely punctate. Legs rather stout, the hind femora strongly clavate, the anterior tibiæ bowed inwards towards the apex. Length 2-2¼, breadth ¾ mm.

Hab. Grenada—Mount Gay Estate, on the Windward side.

Two males. Allied to the Central-American *X. cinctipennis* and *X. chiriquensis*, Champ., but with shorter and less parallel elytra, differently formed antennæ, etc. On bushes, also flying (Smith).

Xylophilus guttatus, n. sp. (Plate I., fig. 15.)

Short and broad, convex, dull; the head piceous or black; the prothorax ferruginous, with a transverse dark brown fascia across the middle, sometimes divided into three spots; the elytra testaceous or ferrugineo-testaceous, with a common transverse patch at the base, sometimes divided at the suture, a spot on the outer part of the disc a little lower down, the sides in front, an angulated fascia about the middle, and a transverse mark on the outer part of the disc near the apex, dark brown; the antennæ and legs flavo-testaceous, the hind femora infuscate; the under surface fusco-ferruginous; the upper surface closely, finely punctate, and thickly clothed with a fine, sericeous pubescence, which is whitish on the head and scutellum, and on the light-coloured portions of the prothorax and elytra, and brown on the other parts; the under surface also closely punctured and clothed with whitish pubescence. Head short and broad; the eyes large, occupying the whole of the side of the head, rather coarsely granulated, narrowly separated in front in the male, a little more distant in the female; antennæ (♂) moderately long, slender, filiform, joints 1 and 2 stout, subequal, 3–10 about equal in length, 3 slightly longer than 2, 11 stout, much

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longer than 10, obliquely truncate at the apex—(♀) shorter and with joints 6–10 gradually increasing in width, 9 and 10 about as broad as long. Prothorax transverse, nearly as wide as the head, with a shallow transverse groove on either side of the disc about the middle. Elytra nearly twice as wide as the prothorax, and about twice as long as broad, narrowing from the middle, and very obtuse behind, without distinct depressions. Legs rather short, the hind femora stout; similar in both sexes. Length 1½–1¾, breadth ⅝–¾ mm. (♂ ♀.)

Hab. St. Vincent—Leeward and Windward sides; Grenada—Chantilly Estate.

Twelve specimens, most of which are in a bad state of preservation. The description is taken from the St. Vincent examples. The two from Grenada are in a mutilated condition, and one of them has the dark markings much more extended and confluent, so as to leave some small whitish-pubescent spots only on the elytra. This peculiar little species is allied to *X. laticollis*, Champ., and other Mexican forms. Beaten from herbage in scrubby forest (Smith).

ANTHICIDÆ.

Macratria.

Macratria, Newman, Ent. Mag., v., p. 377 (1838).

Macratria femoralis, n. sp. (Plate I., fig. 16, ♂.)

Elongate, subparallel, shining, brown or reddish-brown, the prothorax piceous in one example; the head ferruginous, testaceous in front, the eyes black, the antennæ and legs testaceous, the posterior femora with a large black spot on the inner face near the apex; beneath piceous or brown, the last two ventral segments ferruginous; the upper surface thickly clothed with rather long fine decumbent yellowish-cinereous hairs, with scattered intermixed long erect hairs, the under surface also thickly pubescent. Head thickly, very minutely punctate; the eyes large, converging in front; antennæ slender, moderately long, joints 3–8 equal in length, 9–11 much longer and stouter. Prothorax longer than broad, narrowing behind and dilated at the base, densely, finely punctate. Elytra about two and one-half times the length of, and

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a little wider than, the prothorax, broader in the female, parallel to beyond the middle, and conjointly rounded at the apex; closely, finely, confusedly punctate, and with a fine sutural stria. Beneath densely, very finely punctate.

♂. Fifth ventral segment broadly and deeply excavate in the middle, the excavation extending from the base to the apex.

Length 3¾–4½, breadth 1–1½ mm. (♂ ♀.)

Hab. St. Vincent—Windward side, alt. 1,000 feet.

One pair. This species is more parallel and has a relatively wider thorax than most of the American forms known to me; there is no trace of a linear arrangement of the punctures on the elytra; the hind femora have a conspicuous black spot near the apex. The genitalia of the male are exposed; and from the apex of the abdomen there projects a very large, broad, spoon-shaped, membranous piece—apparently a modified terminal dorsal segment, wider than the apex of the abdomen—which is furnished with two long setæ at the apex. Under rubbish on the banks of a stream in the forest (Smith).

Anthicus.

Anthicus, Paykull, Fauna Suecica, i., p. 253 (1798).

Anthicus sulcipennis, n. sp.

Moderately elongate, convex, black or pitchy-black; the antennæ testaceous, with the apical four joints, and sometimes the base of the first also, black; the elytra with two oblique testaceous fasciæ—one before, the other beyond the middle, the anterior one widening outwards, neither reaching the suture; the legs pitchy-black, the tarsi and the base of the femora testaceous; the head and prothorax dull, the elytra shining, the upper surface clothed with a few short fine scattered hairs. Head rather large, convex, suborbicular, finely scabrous; the eyes large and prominent antennæ moderately long, thickening outwardly, the penultimate joint transverse. Prothorax longer than broad, much narrower than the head, strongly constricted and compressed behind the middle, parallel towards the base, the anterior portion globose; the surface scabrous and very finely punctured. Elytra rather short, twice as wide as the prothorax, gradually widening to the middle, very deeply transversely grooved below the base, the space in front of this transversely swollen, except at the suture; the

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surface very finely, rather sparsely punctate. Legs slender, the femora moderately thickened. Length 2½–2¾, breadth ¾ mm.

Hab. Grenada—Mount Gay Estate, on the Leeward side.

Four specimens. Allied to *A. gibbicollis* and *A. albicinctus*, La Ferté, and *A. clavicornis*, Champ., but differing from all these in its finely scabrous head and thorax, and in having an additional fascia on the elytra. The pubescence is sparse and easily abraded. The post-median fascia extends obliquely upwards and the ante-median one slightly downwards, but they do not nearly reach the suture. On bushes in open places (Smith).

Anthicus trifasciatus.

Anthicus trifasciatus, Fabr., Syst. Eleuth., i., p. 291; La Ferté, Monogr. Anthic., p. 139; Fleut. et Sallé, Ann. Soc. Ent. Fr., 1889, p. 432.

Hab. St. Vincent; Grenada; Grenadines—Mustique I.

Found in abundance by Mr. Smith in various parts of St. Vincent and Grenada, and also sparingly at Mustique Island. Recorded by La Ferté from St. Thomas, and by Fleutiaux and Sallé from Guadeloupe. I have also seen it from Trinidad. The markings are frequently indistinct or partly obliterated. In fresh examples the elytra are clothed with scattered, long, erect hairs. Shaken from heaps of decaying weeds in cacao-orchards, etc. (Smith).

Anthicus floralis.

Anthicus floralis (Payk.), La Ferté, Monogr. Anthic., p. 150.
Anthicus basillaris, Say, Journ. Acad. Phil., iii., p. 279; Quedenf., Berl. ent. Zeitschr., 1886, p. 122.
Hemantus floralis, Casey, Ann. N. York Acad., viii., p. 683 (1895).

Hab. Grenada—Mount Gay Estate, on the Leeward side, Balthazar, on the Windward side.

Numerous examples of this cosmopolitan insect were obtained by Mr. Smith. Recorded from Guadeloupe by

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La Ferté, and from Puerto Rico by Quedenfeldt. It is omitted from MM. Fleutiaux and Sallé's list of the Coleoptera of Guadeloupe. This insect has recently been taken by Capt. Casey (*loc. cit.*) as the type of a new genus, *Hemantus*. One of the characters given for it in his Table of genera (*loc. cit.*, p. 641) is taken from the form of the mesosternum, which he describes as "variable in extent, becoming subgeneric in weight": I confess I am quite unable to grasp the meaning of such a definition.

Anthicus grenadensis, n. sp.

Elongate, depressed, shining, sparsely pubescent; testaceous, the elytra piceous or pitchy-black, each with a broad transverse fascia a little below the base and a large ante-apical spot, neither reaching the suture, testaceous; the antennæ sometimes with the outer joints slightly infuscate, the eleventh pale. Head large, subtriangular, with a few scattered punctures at the sides, the occiput grooved in the middle; the eyes moderately large and coarsely granulated; antennæ moderately elongate, rather slender. Prothorax as long as broad, a little narrower than the head, the sides obliquely converging from about one-third from the apex, rounded in front, and slightly dilated at the base; the surface sparsely punctured, canaliculate down the middle, the channel deeply excavate towards the base, the base grooved on either side. Elytra moderately elongate, about twice as wide as the prothorax, feebly rounded at the sides, depressed, finely and somewhat thickly punctate. Length 2¾–3, breadth ⅞–1 mm.

Hab. Grenada—Granville, Windward side.

Four specimens. Allied to *A. currax*, Champ., from Eastern Mexico; but much more shining, the thorax deeply grooved down the middle behind and sparsely punctured, the eyes smaller, etc. Under rubbish on the sandy sea-shore (Smith).

MORDELLIDÆ.

Mordella.

Mordella, Linnæus, Syst. Nat., 10th edit., i., p. 420 (1758).

Mordella sexguttata, n. sp.

Comparatively short; testaceous, the eyes black, the prothorax with an oval piceous mark on the middle of the disc extending to

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near the base, the elytra brownish or piceous, becoming indeterminately paler on the disc towards the base; the under surface with the sides of the metasternum and of the hind coxæ broadly, and the first four ventral segments in great part, piceous, or rufo-testaceous, with the second and third ventral segments only in part piceous; the pygidium in the middle, and the extreme apex of the hind tibiæ and also that of the first three hind tarsal joints, infuscate or black; the elytra each with a small rounded spot near the suture a little below the base, a smaller one lower down at the side, a broad transverse sublunate mark at one-third from the apex, and an indistinct apical patch (visible only in certain lights), cinereo-pubescent, the rest of the pubescence of the upper surface fulvous, that of the under surface fulvous or yellowish-cinereous. Antennæ slender, rather short, joint 3 very small, much shorter than 2 or 4. Elytra rather short, gradually narrowing from the base. Pygidium very elongate, slender. Length to end of the elytra, 2½ mm. (♂.)

Hab. St. Vincent—Leeward side; Grenada—Balthazar, on the Windward side.

Two specimens, one of which is without head and thorax. This pretty little species is allied to the Central-American *M. flavonotata, M. nigromaculata,* Champ., etc. The spots are entirely due to the colour of the pubescence. The hind tibiæ have a single short subapical ridge, as usual in *Mordella.*

CONALIA.

Conalia, Mulsant, Ann. Sci. Nat. Lyon, 1858, p. 313; Opusc. Ent., ix., p. 55; Emery, Essai Mon. Mord., p. 73; Champion, Biol. Centr.-Am., Col., iv., 2, p. 306.

Conalia ebenina.

Conalia ebenina, Champ., *loc. cit.,* p. 306, t. 13, figg. 20, 20*a–c.*

Hab. St. Vincent—Leeward side; Grenadines—Mustique I.

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Found in plenty in St. Vincent. The insect is widely distributed in Central America. It is easily distinguishable by the peculiar sculpture of the hind tibiæ and tarsi (*loc. cit.*, fig. 20*c*) and the extremely short pygidium.

Conalia fulvoplagiata, n. sp.

Short; black, the elytra with an oblique fulvous humeral patch, the basal joints of the antennæ fusco-testaceous, the hind tibial spurs flavous; the pubescence brownish. Antennæ short, joints 3 and 4 slender, short, equal, 5–11 considerably widened, 7–10 transverse. Elytra gradually narrowing from a little below the base. Pygidium very short, not much longer than the hypopygium, and not extending beyond the apex of the elytra. Length, 1⅔–2⅓ mm.

Hab. Grenada—Lake Antoine and Mount Gay Estates, and St. George's, all on the Leeward side, and Grand Ance, at the south end.

Eight specimens. The insect is perhaps nothing more than a colour-variety of *C. ebenina*, but as it seems to be confined to the island of Grenada, it is advisable to name it.

Mordellistena.

Mordellistena, Costa, Faun. Reg. Napol., Mordellid., pp. 16, 31 (1854).

Mordellistena pallida, n. sp.

Moderately elongate, narrow, rather dull; testaceous, the eyes black, the elytra usually indeterminately brownish at the sides below the base, this colour sometimes extending inwards; the extreme apex of the hind tibiæ, and also that of the first three hind tarsal joints, and the oblique ridges, black; the pubescence fulvous. Antennæ slender, moderately long, joints 3 and 4 short, equal. Elytra moderately elongate. Pygidium very elongate, slender. Hind tibiæ with three oblique ridges—two very short, near the apex, the other extending obliquely across their outer face from the middle to near the base; first joint of the hind tarsi with three, the second joint with two, short oblique ridges. Length to end of the elytra, 2–2¼ mm. (♂ ♀).

Hab. St. Vincent—Leeward side, and Kingstown.

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Eight specimens. I have also seen it from Guadeloupe, in the collection of M. Fleutiaux of Paris, and from Antigua, in the collection of the Rev. T. A. Marshall. The anterior tibiæ are very slender in the males. The peculiar sculpture of the hind tibiæ is common to several of the Central-American species of the genus. The insect is nearest allied to *M. luteola* and *M. isabellina*, Champ., from both of which it differs in its much smaller size, shorter antennæ, and shorter apical ridges of the hind tibiæ.

RHIPIDOPHORIDÆ.

Macrosiagon.

Macrosiagon, Hentz, Trans. Am. Phil. Soc., iii., p. 462, t. 15, figg. 3*a–d* (1830).

Emenadia, Castelnau, Hist. Nat. Ins. Col., ii., p. 261 (1840).

Macrosiagon octomaculatus.

Rhipiphorus octomaculatus, Gerst., Rhipiph. Col. Fam. Disp. Syst., p. 22; Fleut. et Sallé, Ann. Soc. Ent. Fr., 1889, p. 432.*

Hab. St. Vincent—Leeward side, and Windward side.

Five specimens. Recorded by MM. Fleutiaux and Sallé from Guadeloupe.

Rhipidophorus.

Rhipiphorus, Bosc d'Antic, Journ. d'Hist. Nat., ii., p. 293 (1792).

Myodes, Latreille, Nouv. Dict. d'Hist. Nat., xxii., p. 130 (1818).

Rhipidophorus (*Myodes*) *sancti-vicentis*, n. sp.

♀. Black, finely pubescent; the legs piceous, with the first joint of the tarsi testaceous at the base. Head densely, finely punctate, broadly concave and smoother in front, obliquely nar-

* The synonymy is given by me elsewhere, *cf.* Biol. Centr.-Am., Col., iv., 2, p. 356.

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rowed behind the eyes; the vertex feebly longitudinally carinate in the middle; antennæ rather elongate, with seven long rami on the inner side, the rami decreasing in length outwards. Prothorax densely, finely punctate; the posterior half of the disc transversely depressed, the depression limited on either side anteriorly by a smooth oblique ridge, in front of which is a smooth space. Elytra coriaceous, finely, shallowly punctate, the humeri smooth and shining. Abdomen, above and beneath, the first dorsal segment excepted, sparsely punctured. Metasternum densely punctured. Intermediate and hind tibiæ bowed inwards; the hind pair broadly compressed and roughly punctured, rounded externally. Hind tarsi with the basal joint slender and slightly curved, as long as the following joints united. Wings hyaline, smoky towards the apex, the costa piceous. Length 4 mm.

Hab. St. Vincent.

One specimen. This small species is allied to *R.* (*Myodes*) *niger*, C. O. Waterh., from Central America; but differs from it in the flat, feebly carinate, vertex, the slender basal joint of the hind tarsi, and the finely and shallowly punctured elytra. The antennæ are furnished with rami on the inner side only, and the specimen is no doubt a female.

CANTHARIDÆ.

Horia.

Horia, Fabricius, Mant. Ins., i., p. 164 (1787).

Horia maculata.

Cucujus maculatus, Swed. Vetensk. Ac. nya Handl., 1787, p. 199, t. 8, fig. 8.

Horia maculata, Fleut. et Sallé, Ann. Soc. Ent. Fr., 1889, p. 433; Champ., Biol. Centr.-Am., Col., iv., 2, p. 371.*

Hab. St. Vincent—southern end.

One mutilated female specimen, found under a rotten log. A widely distributed Tropical-American insect, and stated to be parasitic on a species of the Hymenopterous

* The full synonymy is given by me, *loc. cit.*

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genus *Xylocopa*. Recorded from the islands of San Domingo, Grande-Terre, Guadeloupe, and Barbados; the Barbados insect, however, is probably referable to *H. auriculata*, Champ.

Tetraonyx.

Tetraonyx, Latreille, in Humb. et Bonpl., Obs. Zool., i., p. 160 (1811).

Tetraonyx quadrimaculatus.

Apalus quadrimaculatus, Fabr., Ent. Syst., i., 2, p. 50.
Tetraonyx quadrimaculatus, Lec., Proc. Acad. Phil., vi., p. 344; Haag, Stett. ent. Zeit., 1879, p. 308; Fleut. et Sallé, Ann. Soc. Ent. Fr., 1889, p. 433.

Hab. St. Vincent—South end and Windward side; Grenada—Mount Gay Estate, on the Leeward side.

Three specimens. Also inhabits the Southern United States, and the islands of St. Thomas and Guadeloupe, but not yet recorded from Central America.

Zonitis.

Zonitis, Fabricius, Ent. Syst., p. 126 (1775).

Zonitis lineata, n. sp.

Elongate, broad, parallel, dull, finely pubescent; luteous or flavo-luteous; the eyes, the tips of the mandibles, the palpi, and antennæ black, the latter with the extreme base of each joint testaceous; the elytra variable in colour—fuscous or fusco-testaceous, with the sutural and lateral margins, the apex, and a line or stripe down the middle of the disc flavo-luteous—fusco-testaceous, with a darker patch at the base—flavo-luteous, with two spots at the base and a streak on the disc towards the apex fuscous—or entirely flavo-luteous; the tips of the femora, and the tibiæ and tarsi, black or piceous. Head densely punctured, the punctures very fine on the vertex, the interocular space with a few coarse scattered punctures only, a narrow space down the middle impunctate; the eyes large, transverse, coarsely granulated, separated by a space about half the width of the eye as seen from above; antennæ very elongate, slender, filiform, joints 2 and 3 subequal in length. Prothorax a little broader than long, as wide as the head, rapidly

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and obliquely narrowing from the middle forwards ; densely, finely punctate, a space along the middle more sparsely and more coarsely punctured. Elytra elongate, parallel, nearly twice as wide as the prothorax, obtuse at the apex ; densely, very finely punctate, sometimes with indications of one or two faintly raised lines on the disc. Beneath densely, very finely punctate.

♂. Fifth ventral segment broadly and deeply emarginate at the apex, with a large and very deep triangular depression in the middle, the bottom of the depression smooth and shining.

Length 14–16, breadth 4–5 mm. (♂ ♀.)

Hab. Grenada—Balthazar, on the Windward side.

Six specimens, all attracted to "light." Allied to *Z. megalops*, Champ., from Guatemala.

Explanation of Plate I.

Fig. 1. *Ozolais tuberculifera*, ♂.
2. *Ctesicles insularis*, ♂.
3. *Crypticus undatus*.
4. *Uloma sulcata*, ♂.
5. *Platydema apicenotatum*.
6. *Lorelus brevicornis*.
7. *Lorelopsis pilosus*.
8. *Mentes æneopiceus*, ♂.
9. *Statira vittata*, ♂.
10. *Lobopoda insularis*, ♂.
10*a*. „ „ genitalia.
11. „ *ebenina*, ♂, genitalia.
12. *Copidita quadrilineata*.
13. „ *frontalis*.
14. *Xylophilus nigricollis*, ♂.
15. „ *guttatus*.
16. *Macratria femoralis*, ♂.
17. *Menimopsis excæcus*, ♀.
17*a*. „ „ antenna.

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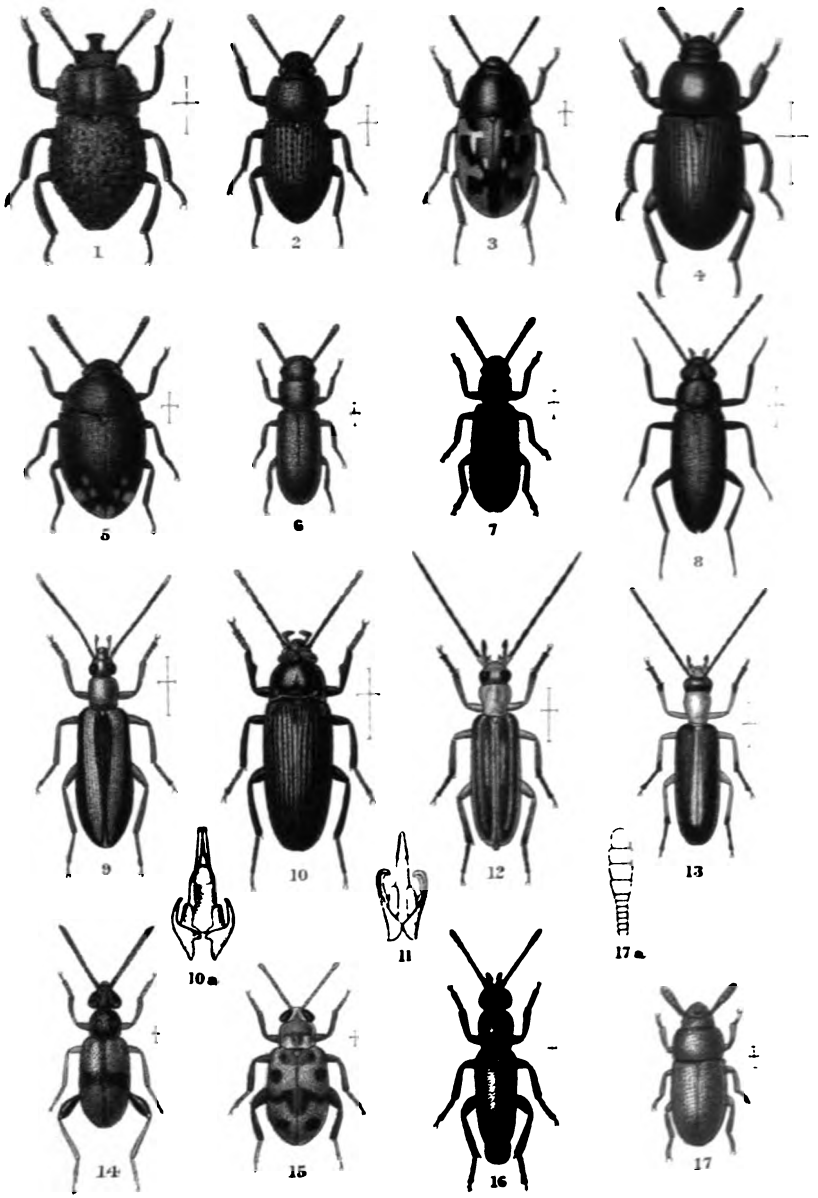

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Mintern Bros. imp

Heteromerous Coleoptera of St. Vincent, Grenada, and the Grenadines.

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II. *New and little-known Palæarctic Perlidæ.* By Kenneth John Morton, F.E.S.

[Read Dec. 4th, 1895.]

Plate II.

About a year ago I attempted a preliminary revision of the palæarctic species of the genus *Nemoura*, as a beginning in the direction of increasing our knowledge of the *Perlidæ*. It was then my intention to take up the genus *Leuctra* next, but the difficulty of getting materials in that genus has led me to postpone treatment of it. Additional material has, however, come to hand in other genera, and I now submit descriptions of several new species belonging to *Nemoura*, *Tæniopteryx*, and *Capnia*.

With regard to *Tæniopteryx*, as the description of the new species will include comparative references to *T. trifasciata*, it will, with the addition of appropriate figures, serve to make the latter species better known, especially as regards the ♂ structure. Albarda's paper (Annales de la Soc. Ent. de Belgique, tom. xxxiii.), dealing at length with the *nebulosa* group, taken in conjunction with the following notes and figures relating to *T. Risi* and *T. trifasciata*, will practically constitute a revision of the European species of the genus, the only species excepted being *monilicornis*, which I have not yet seen.

The addition of another species of *Capnia* to the British list, or rather its separation from the acknowledged *C. nigra*, is interesting, and a *Capnia* from Amurland is also described.

This opportunity is also taken to give a description and figures of a curious little form which may yet be found in this country. It was described by Rostock, in 1892, as *Capnodes Schilleri*; but as the generic name had already been used by Guenée in Lepidoptera in 1852, the new term *Capnopsis* is proposed.

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All those entomologists who assisted me with the *Nemouræ* have contributed help with the present paper. Special thanks are due to Mr. McLachlan, not only for allowing me to examine material which may be called classical, but also for many valuable hints relating to bibliography.

Nemoura Sahlbergi, n. sp.

In the dry insect, head and pronotum are shining blackish; antennæ nearly black; pronotal plate faintly brown on anterior margin, indistinctly rugose on middle of disc, about same breadth as the head without the eyes, borders ill defined, lateral margins receding slightly posteriorly. Meso- and meta-nota also shining blackish, abdomen dull black. Legs dingy testaceous, femora, and apices of tibiæ and tarsi fuscous. Wings greyish, sub-hyaline, iridescent, neuration pale fuscous, and faintly clouded with fuscous about pterostigma and χ nervures; in the hindwings the superior cubitus seems to leave the radius at a considerable distance from the basal cell.

A species of the *avicularis* group, not presenting strong characters, excepting in the appendages of the ♂, which are very distinct. Broad at the base, these appendages become more slender in the shaft, and at the apex there is a broad membranous expansion internally, the chitinized portion forming an out-turned short hook obscurely two-pointed and inwards being produced into two long acute spears. Exp. of forewings, 14 to 17 mm.

I have seen a number of examples from Utsjoki, in the region of Lake Enara, Finnish Lapland, taken by Dr. John Sahlberg, to whom I have pleasure in dedicating the species.

Tæniopteryx Risi, n. sp.

T. trifasciata, pars. auct.

Head dark reddish-brown or blackish, antennæ blackish, long, slender, composed of elongate joints, pronotum blackish, the fore and hind margins sometimes reddish-brown, elongate, narrower in front than behind; meso- and meta-nota shining blackish, abdomen

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dark reddish-brown ; legs reddish-brown, femora and tibiæ tips and the tarsi marked with fuscous. Forewings pale grey, sub-hyaline with darker clouds, neuration fuscous ; hindwings clearer, slightly dark at the tips. In the forewings the number of free nervures running from the upper cubitus to the apical margin is usually two. The darker cloudings are these : a vague blotch nearer the base, followed by a broad median crescent and a narrow crescent, rarely any evidence of an apical blotch.

In the ♂ the ventral plate is large, elongate, lateral margins slightly inturned ; apex strongly recurved, its outline rounded and entire. The genitalia are complicated and the nature of the various parts uncertain ; two spiniform appendages are sometimes visible in addition to those shown in fig. 1. Expanse of forewings : ♂, 18–22 mm. ; ♀, 21–28 mm.

This insect has long been known to Dr. Ris from Switzerland, and held by him to be a good species, contrary to the views of Albarda (expressed in 1889), who considered it to be a form of *T. trifasciata*. It is, however, abundantly distinct from *trifasciata* in which the ventral plate of the ♂ is *shorter*, the apex excised and less recurved. In the present species also the antennæ are more slender, composed of longer joints, and having no moniliform joints like those of *trifasciata*. The smaller number of free nervures arising from the apical portion of the upper branch of the cubitus (Albarda's nomenclature = upper branch of inferior cubitus of *Nemoura*, Trans. Ent. Soc. London, 1894, p. 574) is also a useful character, although perhaps not absolutely constant. It is also noteworthy that in *trifasciata* there is usually a dark marking concave inwardly at the very apex of the wing, of which marking there is rarely, if ever, any trace in *T. Risi*.

As indicated, *T. Risi* has been found in Switzerland (Zürichberg) by Dr. Ris, and amongst Mr. McLachlan's continental material there are ♀'s which I refer in the meantime to this species from the following localities : Albania (S. S. Saunders) ; Pyrenees (Eaton, 10th June) ; France (Ardèche, May, Fallou ; Vosges, 20th July, McLachlan).

In Britain it is probably generally distributed wherever there are fairly rapid streams. Mr. McLachlan has it from Haslemere, Surrey (July) ; Rannoch (between 2nd

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and 12th June, 1865, McLachlan); River Yealm at Cornwood, Devon, 16th May; and Yorkshire (Dunford Bridge, 18th June). It is the species recorded from Rannoch in Ent. Mon. Mag., vol. xxvii., p. 47, as *T. trifasciata* (King and Morton), and I have found it in May and June in almost every hilly district in Scotland which I have visited.

Tæniopteryx trifasciata, P., is no doubt equally widespread, but in this country, and probably elsewhere, it occurs very early in the season, and is therefore perhaps less noticed. In Scotland it is very common in the Clyde district in March, and Mr. King and I found it rather plentiful at Rannoch in the first half of April last (1895). The only British ♂ in Mr. McLachlan's collection is from the last-named locality (the late Dr. Buchanan White), but the species is well represented from the Continent: Meseritz, Posen, Prussia (Zeller, 29th April, 1849; one of the examples named by Brauer); Switzerland (Burgdorf, April, Meyer-Dür); Silesia ? (presumably from Silesia, as the label is in Schneider's handwriting); Turin (15th and 16th March, Ghiliani). In my own collection are examples from Bohemia and Switzerland (Klapálek and Ris, respectively), all taken in March. All the British ♂ examples of *T. trifasciata* seen by me have the wings much abbreviated (expanse 13 to 15 mm.), whereas Continental ♂'s have usually well developed wings (23 mm.) although there are evidently exceptions, one from Turin being short-winged.

Capnia atra, n. sp.

C. nigra, Pictet, Perlides, p. 321, pl. xxxix. (in part) ?

Head and thoracic segments in the dry insect shining blackish. Antennæ blackish, legs and setæ fuscous. Wings sub-hyaline with fuscous neuration. In the forewings the basal end of the lower intercubital cellule is usually acute, or at least much narrowed, and the anterior margin of the upper intercubital cellule is slightly curved. Joints of setæ short. In the ♂ the large side pieces of the genital apparatus are broad at the base, upturned, and subacute at the apex, which when seen from above is barbed; seen from the side there is usually visible beneath or within these pieces

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a slender curved process, with a slight projection or tooth on its under side. The ante-penultimate segment dorsally raised and covered with minute points. Exp. of forewings, 12 to 17 mm., the ♀ the larger.

The ♂ first came under notice from Finnish Lapland, whence it was received from Dr. Sahlberg. It is possible females were included in a collection previously received from the same valued correspondent, and were returned by me as *C. nigra*. The species was found by King and myself in plenty on the shores of Loch Rannoch in April of this year. Three females from Braemar (Buchanan White) appear also to belong here; they have the wings rather abbreviated. The species probably also occurs in Switzerland, but the ♂ of the pair in Mr. McLachlan's collection (Burgdorf, Meyer-Dür) is not in very good condition, and further Swiss material is desirable.

A smaller insect, as a rule, in the ♀ sex than *C. nigra*, and blacker-looking when fresh. The ♂, as far as known, is full-winged. As usual, the important distinctive characters lie in the ♂ genitalia, but the points in the neuration above alluded to should be useful in separating the ♀ from that of *C. nigra*, if they are found as constant elsewhere as they appear to be in this country. A comparison of fresh material will, I think, show the prothorax to be smaller, and with margins more rounded in *C. atra* than in *C. nigra*.

It should be noticed that Pictet's figure of the neuration of *C. nigra* on pl. i., fig. 6 (Perlides, 1841), has the basal end of the lower intercubital cellule comparatively broad, while in his fig. 4, pl. xxxix., *id. op.*, the condition is more like that usual in *C. atra*, the earlier figure being stated as aberrant in the relative explanation of plate xxxix. Further, Pictet says the ♂ of *nigra* is full-winged. On these grounds some might be inclined to hold the species above described (assuming Meyer-Dür's examples as belonging thereto) as the true *nigra*. However, according to information from Dr. Ris (in letters), male *Capniæ*, practically apterous, are found in Switzerland, and from this I conclude that the two species exist there, and I am inclined to think Pictet may have confused them. The differences in the figures just alluded to become therefore of importance, and as the earlier one

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seems to refer to the species now generally known as *Capnia nigra*, I retain the old name for that species.

Capnia affinis, n. sp.

Very closely allied to *C. atra*, and of about the same size, but as far as can be judged from the examples, which are carded, more brownish in colour of the head and thorax, and with wings more greyish and paler neuration.

The genitalia are also on the same plan as in *C. atra*, but differ in the following details: the barbed part of the side pieces is placed dorsally, so that it is distinctly visible when viewed from the side, and the slender curved process beneath these pieces terminates simply without projection or tooth.

Three males and a number of females from Blagowik, Amurland (22nd April), received from Mr. McLachlan. This insect may only be a race or condition of *C. atra*, but it appears sufficiently well marked to deserve a special name.

Capnia nigra, Pictet.

C. nigra, Pictet, Perlides, p. 321, pl. xxxix (in part) and pl. i. (?). *C. nigra*, Brauer and Löw, Neur. austr., p. 30 (1857).

Chloroperla bifrons, Newman, Ent. Mag., vol. v., p. 401 (1838), and Mag. Nat. Hist., n. s., vol. iii., p. 89.

For the sake of comparison with the species of the *atra* group, a few figures and notes relating to this species are given. The number of nervules between the costa and sub-costa of forewings is irregular; one only is shown in figure 4, but there may be as many as three about the middle of the wing.

Only limited materials for this species have been examined. It is a common species in the Clyde district in early spring (March and April). Brauer's Austrian types in McLachlan's collection do not seem to differ from British examples, and I have seen similar examples from Bohemia (Klapálek). Examples from Turkestan differ so little in the structure of the ♂ genitalia, that at

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most they can only be considered a geographical race of *nigra*, and females from Mingrelia are large, but otherwise not appreciably distinct.

All the European males seen by me have the wings reduced to mere scales, but the ♂ from Turkestan has effective wings.

On the discovery of a second British *Capnia*, the *Chloroperla bifrons* of Newman required investigation. Mr. Waterhouse has very kindly compared the single ♀ type in Stephens' collection with both species, and is of opinion that on the whole it agrees most closely with *C. nigra*, although the basal end of the lower intercubital cellule is hardly in the condition more typical of this species. As already indicated this cellule is usually distinctly biangulate and rather broad at the basal end in *C. nigra*.

Capnopsis, n. n.

Capnodes, Rostock, preoccupied.

Capnopsis Schilleri, Rostock. (Berliner Ent. Zeitschrift, xxxvii., p. 3, 1892.)

Generic characters: Hindwings smaller than forewings and without any folded portion. Sub-costa terminating about the middle of the wing. No transverse veinlets between costa and radius, beyond the junction of the sub-costa. Maxillary palpi apparently with the two basal joints short, the others long; 4th and 5th sub-equal, the 3rd slightly longer. Antennæ sub-setaceous, joints elongate, only 3 or 4 at the base shorter. Tarsi with minute middle joint, 1st and 3rd joints long, sub-equal. Setæ very short, with 9 or 10 joints only (probably only 7 in the ♂ if the difference be not due to mutilation).

Description: blackish, shining, clothed with short yellowish pubescence. Antennæ blackish fuscous, nearly black, clothed with short yellowish hairs, with five or six stronger erect hairs at apex of each joint. Pronotum about same breadth as head, transverse, margins all slightly rounded, a distinct border all round, disc rugose. Wings greyish sub-hyaline, neuration fuscous. Legs fuscous with yellow pubescence. Setæ fuscous. In the only ♂ examined the last ventral segment is somewhat rounded at the apex, and from either side of it arises a flattened piece; these

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pieces converge, and when seen from the side are upturned and triangular in outline ; superior to these pieces and passing between the setæ is a large upturned tapering process (presumably the penis) which appears to have on either side of it a spiniform sheath. The ♀ does not appear to have any salient characters at apex of abdomen. Expanse of forewings : ♂, 9½ mm.; ♀, 12 mm.

Originally described from near Dresden it has since been received from Finland, where it has been taken in several localities by Sahlberg and Palmén. As its continental range is thus considerable, it may yet prove to be an inhabitant of Great Britain.

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Explanation of Plate II.

Nemoura Sahlbergi, ♂.

Fig. 1. Apex of abdomen from beneath.
2. Apex of lateral appendage from side, internal aspect (more enlarged).
3. Apex of lateral appendage from side, external aspect (more enlarged).

Tæniopteryx Risi, ♂.

1. Apex of abdomen from side (from fresh example and much enlarged).
2. Ventral plate from side (dry).
3. Apex of ventral plate from above (dry).

Tæniopteryx trifasciata, ♂.

1. Apex of ventral plate from above (dry).
2. Apex of abdomen from side (dry).

Capnia nigra.

1. Apex of abdomen of ♂ from side.
2. Apex of penis (?) from side in outline much enlarged (Scotland).
3. Apex of penis (?) from side in outline much enlarged (Turkestan).
4. Neuration of anterior wing of ♀, *a*, *b*, intercubital cellules.
5. Neuration of posterior wing of ♀.

Capnia atra, ♂.

1. Apex of abdomen from side.
2. Intercubital cellules of anterior wing.
3. Dorsal view of side piece of genitalia (much enlarged).

Capnia affinis, ♂.

1. Apex of abdomen from side.

Capnopsis Schilleri.

1. Neuration of anterior wing.
2. Neuration of posterior wing.
3. Apex of abdomen of ♂ from side, nearer seta removed.

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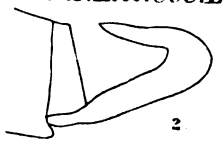
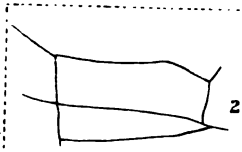
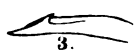
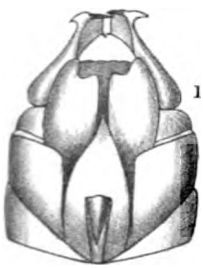
I. Risi.







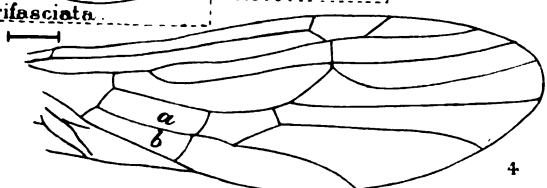
C. atra.

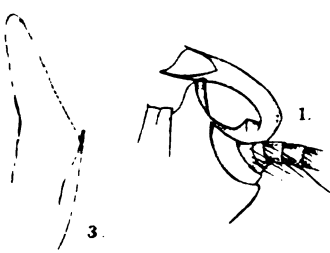


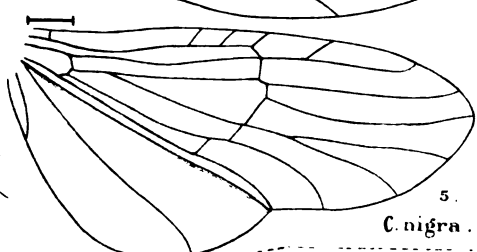
T. trifasciata.

C. affinis.

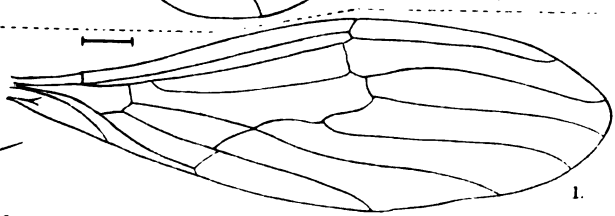
N. Sahlbergi.

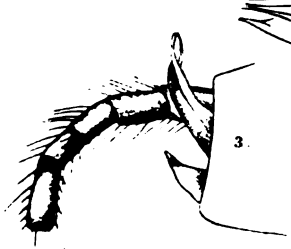




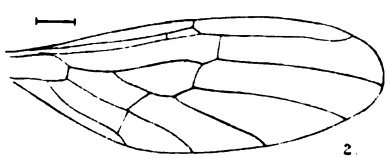


C. nigra.





C. Schilleri.



L. J. Morton del.

New or little known Palæarctic Perlidæ.

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III. *On the Relation of Mimetic Patterns to the Original Form.** By Frederick A. Dixey, M.A., M.D., F.E.S., Fellow of Wadham College, Oxford.

[Read Feb. 5th, 1896.]

Plates III., IV., & V.

I. The Gradual Growth of a Mimetic Pattern.

It is now many years ago that Fritz Müller published an answer to those opponents of the theory of mimicry who made much of the difficulty of accounting for the first advances towards the formation of a mimetic pattern.† In the course of this communication he pointed out (as indeed Darwin had done before him) that mimicker and mimicked might, in many instances, be reasonably supposed to have started, not from a position of wide divergence from each other, but rather with the possession of some feature or features, common to them both, which should give material ready to hand for the assimilative process to work upon. The chief instance relied on by Fritz Müller in support of his contention was the well-known mimetic genus of Pierine butterflies known as *Leptalis* or *Dismorphia*.‡ The black and yellow *Leptalis* (*Dismorphia*) *melia*, according to him, was to be regarded as representing the primitive type of coloration of the genus; and although it did not itself mimic any other form, it nevertheless showed independently so much of the characteristic Heliconine colours and arrangement of pattern, that the complete Heliconine aspect presented by many of its near relatives could be derived from it with comparatively slight modification.

* A preliminary abstract of the present paper has appeared in the British Association Reports for 1894.

† "Einige Worte über Leptalis," Jenaisch. Zeitschr., vol. x., 1876, p. 1.

‡ The old genus *Dismorphia* has been divided by Messrs. Godman & Salvin into *Dismorphia*, *Pseudopieris*, *Enantia*, and *Acmepteron*, Biol. Centr.-Amer., Rhopal. II., p. 174. Dr. Butler further distinguishes *Moschoneura*, Cist. Entom., Pt. iii.

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The instance chosen by Fritz Müller was unfortunate. A wider view of Pierine affinities than he had the opportunity of taking would no doubt have led him to the conclusion that, after all, the original *Leptalis* probably was a white or white and black butterfly, and not a black and yellow or black and orange insect like *Leptalis* (*Dismorphia*) *melia*. Moreover, the position that *D. melia* is not a mimic can hardly be sustained. It bears a very considerable resemblance to *D. eumara*, which is itself an almost exact copy of *Actinote pellenea*; *Actinote* being the neotropical representative of the well-known inedible genus *Acræa*. There is little room to doubt that *D. melia*, so far from preserving the primitive *Leptalis* type, has diverged to some distance therefrom under the influence of mimicry.

But although Fritz Müller's principal instance does not appear to me to be strong enough to bear the weight of argument that he rests upon it, there cannot be much question that his contention in the main is perfectly sound; and that, as a general principle, the process of mimetic assimilation depends rather on the development of old, than on the starting of new features, either of pattern or of colour.

In order to illustrate this principle, I have prepared the series of figures shown in Plates III. and IV., Figs. 1–12. These represent an array of facts that I venture to think are in many respects of great interest.

Fig. 1 shows the underside of the male of one of the ordinary neotropical non-mimetic Pierines*, a true *Pieris* as that genus is restricted by Dr. Butler—*P. locusta* of Felder. The chief points to be observed are in the hindwing. They are (1), the spots or patches of bright red which are found at the base of the precostal, median and internal spaces respectively (Fig. 1, *a*, *c*, *d*); (2) a well-defined yellow streak (*e*) occupying the costal space; (3) a pale central area (*f*), in many specimens yellowish, occupying the region of the cell and the adjacent portion of the wing, especially towards the internal border; (4) a dark shade (*h*, *i*) on the anal and costal sides respectively of the pale central area. The present species happens to be a rather heavily coloured member of its group, but in other species of the same genus

* See below, p. 72, note.

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Pieris we get a great lightening of the general tone of colour, without however losing the essential features now referred to. In *P. phaloe* for instance, also a non-mimetic *Pieris* from the same neotropical region, we have as it were an attenuated and washed-out version of the scheme of marking seen on the hindwing of *P. locusta*. Here (Fig. 2) are visible the same basal red patches, though now confined to the precostal and internal spaces; the same pale costal streak and central area, now in most specimens white rather than yellow; and on either side of the latter the same two dark shades, now reduced to a pair of brownish streaks. From either of these types to the well-known Heliconine form here represented by *Heliconius numata* (Fig. 11), seems a sufficiently long step; nor is it at first sight apparent that there is anything in common between the former and the latter schemes of coloration. Nevertheless, while it will be allowed on the one hand that the female of *Mylothris pyrrha* (Figs. 9, 10) presents a very good imitation of *H. numata*, it can be shown on the other hand that this last-named Pierine owes its mimetic features to a simple development of characters already possessed by the other Pierine forms just spoken of, to which it is closely allied.

In order to make this apparent, it will be necessary to refer to some of the other neotropical species of the same genus *Mylothris*. This interesting little group, comprising besides *M. pyrrha* the closely related *M. malenka*, *M. lypera*, and *M. lorena*, has been more than once spoken of by Mr. Wallace* as affording an instance of mimetic females associated with males of the ordinary white type of Pierine coloration. It is quite true that all the males throughout the group exhibit on their upper surfaces nothing but the ordinary white character; Mr. Wallace, however, does not mention the curious fact that the same males universally show on the under surface, though in varying degrees, an approach towards the Heliconine pattern that is so completely imitated by their mates. These partially developed features on the under surface of the males enable us to trace the history of the growth of the mimetic pattern.

Let us take the underside of the male of *Mylothris*

* "Tropical Nature," 1878, p. 204; "Darwinism," 1889, p. 271.

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lypera (Fig. 3), and compare it with that of *Pieris locusta*. There is no difficulty in identifying the principal markings as before enumerated. The yellow costal streak and central area (*e*, *f*) and the anterior and posterior dark shades (*h*, *i*) are present in *M. lypera* as in *P. locusta*, all occupying the same relative positions; the precostal red however has disappeared, and the internal and median touches of the same colour have united and prolonged themselves into a triangular streak reaching about a third of the way across the wing (*cd*). A small dark area (*g*), which in *P. locusta* lies immediately posterior to the internal red patch, has in *M. lypera* extended itself in the same direction with the extension of the patch, and has, beyond the outer extremity of the latter, united with the anterior dark area (*i*) in such a way as to completely surround the red patch with a distinct region of black. All the areas somewhat vaguely indicated in *P. locusta* have in *M. lypera* acquired a distinct and definite character with sharply-marked, clear-cut borders. There is no doubt of the homology of the markings in the two cases, nor does the change from one to the other deserve to be called either violent or abrupt.

The underside of the male of *M. lorena* (Fig. 4) takes us a step onward. Here are exactly the same features, but with a further development along the same lines. The red patch has now become a definite streak reaching half-way across the wing, but still bears the same relation to the anterior dark area. The costal streak and central area have undergone a similar elongation, and in this instance are much paler in colour. The whole aspect perhaps recalls that of *P. phaloe* rather than that of *P. locusta*, and the correspondence with the former insect is still further borne out by the presence of a diagonal dark streak (*k*) in the forewing, part of which is indicated in *P. phaloe*, uniting the costal with the posterior or outer margin.

The general streakiness of the male of *M. lorena* is preserved or enhanced in the male of *M. pyrrha* (Fig. 5). There is in this case no diagonal dark band crossing the forewing, but the red streak of the hindwing acquires additional distinctness and importance, while the banded appearance is further increased by a slight change in the disposition of the enveloping black.

As far as the hindwing is concerned, we have now

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all but reached the complete mimetic condition of *M. pyrrha* ♀ (Figs. 9, 10). The only thing still wanting is an infusion of more or less brownish red into the pale yellow or orange of the costal and central streaks. It is observable that even in the female *M. pyrrha* the assimilation between the old red of the basal patch and the new red of the costal and central areas is not quite perfect, the former always retaining on the under surface a more vigorous and decided tint than the latter (see Fig. 9, *e*, *cd*, *f*).

With regard to the forewing, there is no doubt a considerable interval between the male and female of *M. pyrrha*. An inspection, however, of the female of *M. lorena* and *M. malenka* (Figs. 6, 7, 8), enables us to see how it may be bridged over. Comparing the sexes of *M. lorena* (Figs. 4, 6, 7), we find that their patterns are identical in the main features, though the female has an additional dark streak in the forewing (*l*) running parallel with the inner border. The central pale area of the hindwing has also in the female almost or entirely disappeared from the lower surface, while the other spaces on both wings which in the male are white or very pale yellow, assume in the female a deeper yellow, warming towards the base of the wing to an orange or brownish red. These changes, comparatively slight as they are, are sufficient to give the female *M. lorena*, a decidedly Heliconine aspect. They point out, moreover, the manner in which the still more completely Heliconine facies of *M. malenka* ♀ (Fig. 8) and *M. pyrrha* ♀ (Figs. 9, 10) may grow naturally out of the Pierine materials already noticed. A very close comparison of *M. pyrrha* with *H. numata* (Figs. 10, 11) will indeed show that the correspondence of markings is not absolutely perfect in every particular; nevertheless, the general effect is marvellously alike, and if assisted by similarity in habits and mode of flight, must be amply sufficient for all practical purposes of protection to the *Mylothris*.

Looking at this series as a whole, and bearing in mind that it would be possible to include other forms * which would render the gradation still easier than is shown

* For example, *P. marana* and *M. lypera* ♀.

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here, we cannot, I think, feel any doubt that it is sufficient to demonstrate the possibility of the formation of a practically perfect mimetic pattern from the ordinary form of a quite distinct type, without any violent or abrupt changes of design. It does not, indeed, lend any support to the view that mimicry can only originate between forms that already possess considerable and obvious resemblance to one another, nor does it countenance the opinion that mimetic changes are effected *per saltum*. What the series of forms here figured does show is that, granted a beginning however small, such as the basal red touches in the normal Pierines, an elaborate and practically perfect mimetic pattern may be evolved therefrom by simple and easy stages.

II. Sexual Dimorphism in Mimetic Forms.

There remains, in regard to the foregoing series, a question of great interest; namely, what is the meaning of the diversity between the sexes in these more or less completely mimetic forms? Why should the one sex have advanced so much further along the mimetic path than the other? It is no doubt the case that the females stand in greater need of protection than the males, but to say this still leaves several questions unanswered. Are we right in regarding the male patterns as perpetuating stages through which the other sex has also passed in order to reach its present state of mimetic completeness, or are we to suppose that the selection by enemies has affected only the female sex, and that the patterns seen on the males are merely an incidental result of heredity, being, in fact, a secondary version of the female pattern transmitted in a weaker form? In either case, what has checked the further development of mimicry in the male? Is this imperfect development simply a passive result of the absence of necessity for change, or is there some active force at work preventing a further modification? It is well known that an explanation of a somewhat similar case has been sought in the principle of sexual selection; the females, it was suggested, as the more conservative sex, preferring in their mates the ancestral type of coloration of the group.* Mr. Wallace,

* Belt, "Naturalist in Nicaragua," Ed. 1888, p. 385.

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on the other hand, points out that in the Pierine group before us the habits of the two sexes are different; that whereas the females haunt the forest glades in company with the Heliconii, the males congregate and fly in the open with other species of white butterflies, among whom a reddish or brownish insect would be especially conspicuous, and would be very liable to experimental tasting.* This fact would seem to supply an active check on the development of the pattern in the male, but it still leaves undetermined the meaning of so much of the Heliconine colouring as does exist, and of this Mr. Wallace has offered no explanation.

I am myself inclined to think that however much it may be to the advantage of these male forms to be taken under some circumstances for white butterflies of the ordinary kind, yet there must be times and occasions—probably while the insect is at rest and settled—when the partial mimicry of the underside comes into play, and tends to afford protection. An instance in support of this view exists in *Hesperocharis hirlanda* (Fig. 12). This insect, like the males of those that have just been considered, is on the upper surface an ordinary white butterfly of the usual kind; the lower surface, however, presents an incipient mimetic pattern of a like degree of development with those of *Mylothris lorena* ♂ and *M. pyrrha* ♂. This can be no feeble reflection of a mimetic pattern complete in the female, for the sexes of *H. hirlanda* hardly differ; moreover *H. hirlanda*, with one or two other forms probably not specifically distinct from it, is the only species of its genus which shows any approach towards a mimetic coloration. The mimicry, slight as it is, must therefore, it would seem, be of some service, as otherwise it would in this case be meaningless; and if this be so with *H. hirlanda*, it is reasonable to suppose that whatever amount of protection such an approach to the Heliconine pattern confers, is also shared by the males of *Mylothris*.

A further point of interest that arises in connection with *H. hirlanda* is this—that a mimetic effect which generally resembles that of *M. pyrrha* ♂, is here reached by different means. *Hesperocharis*, like *Mylothris*, starts no doubt from a regular Pierine form, such as that

* "Tropical Nature," 1878, p. 205.

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exhibited by *P. phaloe*; but whereas in *Mylothris* the main red streak of the hindwing arises from the internal and median basal red, and is central (Fig. 5, *cd*), in *Hesperocharis* it results from a development of the precostal and costal red patches, and occupies the corresponding regions of the wing (Fig. 12, *a*, *b*). The precostal red is undeveloped in *Mylothris*, and the median red is undeveloped in *Hesperocharis*. One result of this is that in the latter form the relative position of the main yellow and red streaks is reversed; notwithstanding which the general resemblance to *Mylothris* is considerable, and the difference would very probably remain undetected by many insectivorous animals. The present point has already been noticed by me elsewhere.* I draw attention to it here simply because it affords another illustration of the gradual growth of mimetic patterns from an original non-mimetic form.†

III. Reciprocal Mimicry between Inedible Forms.

In the previous communication to the Entomological Society‡ of which I have already made mention, I drew attention to certain facts which I am now able to illustrate by Pl. V., Figs. 13 and 14, representing the undersides of a Pierine (*Pereute leucodrosime*) and a *Heliconius* (*H. melpomene*) respectively. Both *Heliconius* and *Pereute* are, it will be seen, furnished with basal red spots, and this is the case with very many of the *Heliconii* and their

* Trans. Ent. Soc. Lond., 1894, p. 286.

† Throughout the foregoing remarks, *P. phaloe* and *P. locusta* ♂, have been spoken of as non-mimetic forms. This is undoubtedly the case with *P. phaloe*, but it is perhaps possible that even in *P. locusta* ♂, the underside of the hindwing may have (especially in darkly-coloured individuals) a certain mimetic value. The underside of the hindwing in *P. locusta*, *P. cinerea* and some others resembles that of *Heliconius melpomene* and other protected species in giving the general idea of a dark wing-area with yellow costal or precostal streak and basal red spots. The forewing of *P. locusta* contains a large surface of white, but this would be partly or wholly concealed in the resting position. It is true also that the yellow streak and red patches do not occupy exactly corresponding positions in the *Pieris* and the *Heliconius*; but there is abundant evidence to show that while *affinity* displays great respect for the exact position on the wing of any given feature of the pattern, *mimicry* to a large extent disregards this, and aims rather at a general similarity of effect. See the instance of *Hesperocharis hirlanda* above, and see also below, p. 74, note.

‡ Trans. Ent. Soc. Lond., 1894, pp. 296, etc

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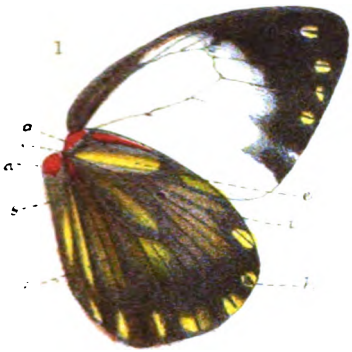
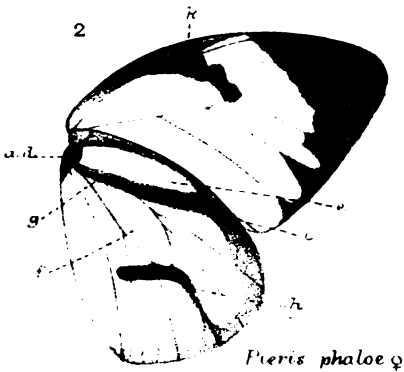
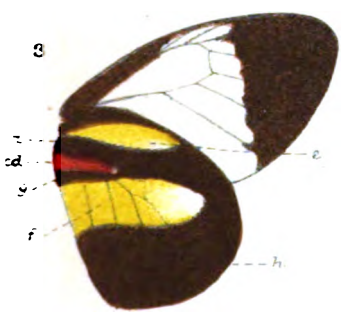


Pieris locusta ♂
under side

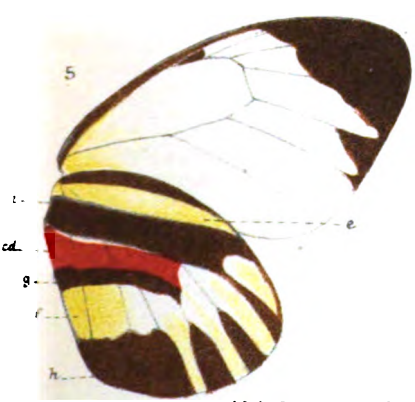


Pieris phaloe ♀
under side

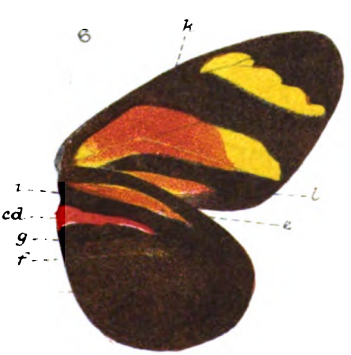


Mylothris bypera ♂
under side

Mylothris lorena ♂
under side



Mylothris pyrrha ♂
under side



Mylothris lorena ♀
under side

F.A. Lucas, imp.ᵗ West, Newman chromo.

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Pierine imitators. What is the meaning of this coincidence? The first answer that suggests itself is that it is simply an ordinary case of mimicry; the red spots belong originally to the *Heliconius*, and the Pierine has acquired similar spots in order to complete the mimetic picture. Two facts, however, militate against this supposition. The first is that these red patches, so far from being confined to the mimicking Pierines, are found to have a very wide distribution throughout the whole Pierine subfamily, existing not only, as we have seen, in non-mimetic neotropical forms such as *Pieris locusta* and *P. phaloe*, but in numerous old-world genera as well, reaching a great development in the Indian and Australian *Delias*, and having even left a relic in the common white butterflies of our own country. It would be extravagant to suppose that these widespread characters owe their origin simply to the necessity for mimicking certain South American *Heliconii*. Moreover, as I have elsewhere shown, such an origin for the old-world forms as this hypothesis would involve is at variance with what is known of Pierine phylogeny. The second fact is that although several *Heliconii* which are not the subjects of mimicry show marks of the kind, yet they are most constant, most distinct and most Pierine-like in species of *Heliconius* that serve as models. There must, it would seem, be a relation between the two forms which is not entirely due to mimicry by the Pierine. Are we then to say that the *Heliconius* is the mimic and the Pierine the model? This would appear to be going against all received ideas on the subject, and to be negatived by all that is known of the inedible qualities of *Heliconius* and of the ancestral coloration of the Pierines; nevertheless, with respect to the particular marks in question I believe that it comes near to the true expression of the fact, and I would suggest that the key to the difficulty is to be found in the following considerations.

It has been well shown by Fritz Müller,* whose conclusions have been followed and amplified by Meldola and Poulton, that there exist two kinds of mimetic associations—in one of which an edible form shelters itself by resemblance to another form well known to be inedible, this being the aspect of mimicry first detected and explained by Bates; while in the other a group is constituted all of whose members are inedible, and join

* "Kosmos," 1879, p. 100.

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[illegible]

[illegible] Heliconius [illegible] seem, be a relation between the two forms which is [illegible] entirely due to mimicry by the Pieridæ. Are we then to say that the Heliconius is the model and the Pieris the model? This would appear to be going against [illegible] received ideas on the subject, and to be contradicted by [illegible] that is known of the relative positions of Heliconius and of the ancestral coloration of the Pieridæ; nevertheless, with respect to the particular cases in question I believe that it comes near to the true expression of the fact, and I would suggest that the key to the difficulty is to be found in the following considerations.

It has been well shown by Fritz Müller,* whose conclusions have been followed and amplified by Meldola and Poulton, that there exist two kinds of mimetic association—in one of which an edible form shelters itself by [illegible] another form well known to be inedible, [illegible] aspect of mimicry first discovered and [illegible]s; while in the other a group of [illegible] whose members are inedible, and [illegible]

* "Kosmos," 1879, p. 100.

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forces, so to speak, in order to share the dangers of experimental tasting. In the first kind it is obvious that the only imitation must be by the unprotected of the protected form; there is no force tending in the converse direction. But in the second kind it does not seem to have been sufficiently noticed that, especially if the numbers of the associated species are approximately equal, there may fairly be expected to arise a kind of give-and-take arrangement, in consequence of which two or more inedible forms may hasten the assimilative process by imitating each other. This is my reading of the case before us. There are some independent grounds* for thinking that the mimicking Pierines in this particular group of instances are not, as has been generally assumed, edible. It is therefore not unreasonable to suppose that being distasteful, like the associated *Heliconii*, and forming with them a company for mutual protection, they have both taken from and bestowed on them characteristic features of pattern—both sides, in fact, having undergone what I some time since ventured to call "reciprocal mimicry." I have elsewhere given more detailed reasons in support of this view; I reintroduce it here for the sake of illustrating it from those Pierine marks that have been specially under consideration.†

* *E.g.*, (1) the abundance of some of the mimetic species of the same or of a closely allied genus, as *Pereute charops* and *Euterpe tureas* (testified to by Messrs. Godman and Salvin and by Fritz Müller respectively); and (2) the fact that the nearest old-world representatives of the same group, *i.e.*, the members of the genus *Delias*, have all the characteristics of insects protected by a disagreeable taste or odour.

† It may perhaps be objected that the resemblance between such forms as are represented in Figs. 13, 14 is not sufficiently close to warrant the supposition of mutual protection between them. To this it may be replied, that (1) the colour of the diagonal band of the forewing is probably in the living *Heliconius* much nearer to that of the *Pereute* than appears in the figure, which was taken from a specimen that had been for some years in the Hope collection. It is well known that the reds in *Heliconius* and *Acræa* are especially apt to fade on keeping. (2) The resemblance may be enhanced by attitude, the figures having been drawn without any particular attention to this. (3) The brightly coloured basal marks, though occupying different relative positions in the two insects, convey the same general idea of a gently-curving, slender, white or yellow streak (belonging to the forewing in the *Pereute* and the hindwing in the *Heliconius*), beset near its base with isolated spots of vivid red, and traversing a black or dark-brown area of wing close to the body.

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The same argument will apply to features similar to the above which may be seen in certain *Papilioninæ*, *Nymphalinæ*, *Erycinidæ*, and even in some moths. And I may say in passing that Fritz Müller's principle here referred to appears to me to be of much wider application than has been hitherto supposed. There exist several large groups more or less uniform in their scheme of coloration, though heterogeneous in their affinities, which it seems almost certain will in the main turn out to be cases of "inedible associations," each one possibly including a few instances of true mimicry within its borders. In deciding on the actual nature of such resemblances, it may be borne in mind that "reciprocal mimicry" constitutes good evidence of the distastefulness of all the forms between which it can be shown to occur, while the abundance or scarcity of a mimetic insect is also a valuable test of its edibility.

IV. Divergent Members of an Inedible Group.

The last set of figures (Pl. V., Figs. 15–18) discloses a remarkable state of things, which is of interest both in its bearing on what has been advanced in the preceding section, and also as providing a further illustration of the importance of small changes. The *Papilio* represented in Fig. 15 (*P. zacynthus* ♀) is undoubtedly the model for the Pierine shown in Fig. 16 (*E. tereas*). These two insects form one of Bates's original instances of mimicry. But beside the latter we have another *Euterpe*, viz., *E. bellona* (Fig. 17), whose markings are, without doubt, homologous with those of its congener. *E. bellona* however, though so closely resembling *E. tereas* the mimic of *P. zacynthus*, itself copies, not the *Papilio*, but the members of a group of *Heliconius* of which *H. erato* (Fig. 18) is a good example. The bright yellow patch on the forewing of the *Heliconius* is very well imitated by the Pierine, and on the hindwing of the latter the crimson patch of *E. tereas*, etc , has been modified into a series of scarlet stripes; these being a palpable attempt to reproduce the radiating chestnut streaks of *H. erato* or one of its congeners. It is curious to see what slight modifications between the two species of *Euterpe* enable them to

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imitate two such distinct insects as the *Papilio* and the *Heliconius*.*

The addition of these two forms, viz., *Euterpe bellona* and *Heliconius erato*, the former of which was perhaps not known to Bates, evidently complicates the "mimicry" question. Is the resemblance between the *Heliconius* and the *Papilio*, which certainly exists though it is not very close, accidental? But for the intermediate Pierine forms we should perhaps not have suspected any special relation between them. On the other hand, is the *Heliconius* the general model for all the rest? If so, *P. zacynthus* becomes a mimic instead of a model; while its own imitator, *E. tereas*, is in the curious position of mimicking a mimic, instead of going straight to the fountain-head, *i.e.*, the *Heliconius*.

In my opinion, the most satisfactory way of accounting for these complicated relations is the supposition that here we have another instance of a mimetic assemblage of the second kind—an "inedible association." The two extreme forms, viz., the *Papilio* and the *Heliconius*, which by themselves might perhaps not be sufficiently near one another to be mutually protective to any very great extent, are held together, as it were, within the limits of an inedible mimetic group, by the welding power of the intermediate *Euterpes*.† It is of interest in connection with what has been already advanced as to reciprocal mimicry, or the give-and-take system, in associations of this kind, that the *Papilio*, the *Heliconius* and both Pierines are furnished on the underside with basal red spots.

V. Conclusion.

It cannot, I think, be doubted that the remarkable facts touched upon in the present paper raise points of fresh interest in the great question of mimicry. The leading and binding idea in all that I have said has been

* The Heliconine pattern is still further developed in the female, and on the under surface of the male of *E. bellona*, than on the upper surface of the latter sex as represented in Fig. 17.

† The series could be rendered still more complete by the insertion of *E. critias* and *E. bellona* ♀, on the *Papilio* and *Heliconius* sides respectively of *Euterpe bellona* ♂.

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my conviction, formed after much deliberation, of the gradual and natural character of these complicated changes, and of the absence of any violent or arbitrary element in their process of development. Whether the explanations here suggested are true and adequate, can in most instances only be decided by observation in the field; and it is much to be desired that travellers and residents in countries where these and similar phenomena occur should carefully record all facts relating to the habits, postures, modes and times of flight, prevalence, seasonal occurrence and exact distribution of the various species that come under their observation.

There is also need of such experimental evidence as to the means of defence adopted by these forms as can only be satisfactorily obtained in the midst of their natural surroundings. Meanwhile, it must suffice to point out the conclusion towards which the only facts available appear to lead, while the actual verification by observation and experiment must perforce be left to those whose opportunities enable them to apply these final tests to the subjects of enquiry.

My best thanks are due to Prof. Poulton, F.R.S., for much encouragement and many facilities for work. The figures were drawn, by his permission, from specimens in the Hope Collection at Oxford.

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List of Species mentioned.

Pierinæ.

Pereute leucodrosime, Koll.
Euterpe tereas, Godt.
„ *critias*, Feld.
„ *bellona*, Cram.
Mylothris pyrrha, Fabr.
„ *lorena*, Hew.
„ *lypera*, Koll.
„ *malenka*, Hew.
Hesperocharis hirlanda, Stoll.
Pieris locusta, Feld.
„ *phaloe*, Godt.
„ *marana*, Doubl.
„ *cinerea*, Hew.
Dismorphia melia, Godt.
„ *eumara*, Doubl.

Papilioninæ.

Papilio zacynthus, Fabr.

Acræinæ.

Actinote pellenea, Hübn.

Heliconinæ.

Heliconius melpomene, Linn.
„ *erato*, Linn.
„ *numata*, Cram.

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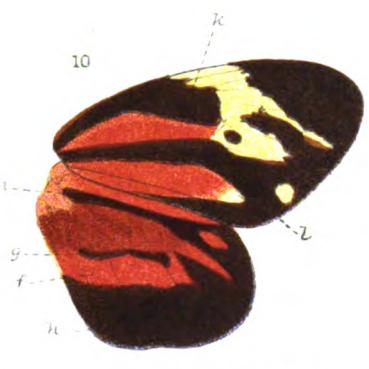
Mylothris lorena ♀
upper side.

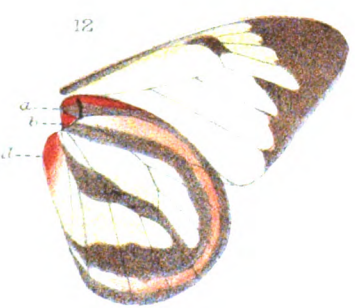
Mylothris malenka ♀
upper side.

Mylothris pyrrha ♀
under side.



Mylothris pyrrha ♀
upper side.

Heliconius numata
upper side.



Hesperocharis hirlanda
under side.

FAHurst, imp.t

West, Newman chromo.

Growth of Mimetic Patterns.

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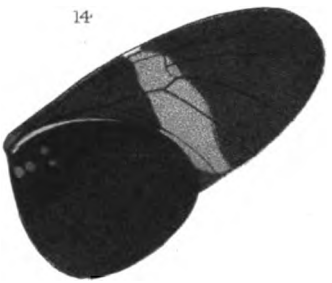
13

Pereute leucodrosina
under side

14



Heliconius melpomene
under side

15

Papilio zacynthus ♀
upper side.

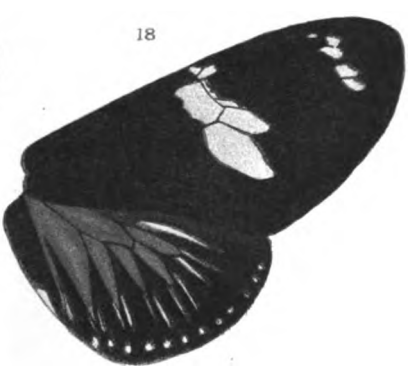
16

Euterpe tereas
upper side

17

Euterpe bellona ♂
upper side

18



Heliconius erato
upper side

F.E. Lixey print

West, Newman chromo

Mimetic Patterns
(Müllerian Groups

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Explanation of Plates III., IV., & V.

Plate III.

Fig. 1. *Pieris locusta* ♂, underside.
2. *P. phaloe* ♀, „
3. *Mylothris lypera* ♂, „
4. *M. lorena* ♂, „
5. *M. pyrrha* ♂, „
6. *M. lorena* ♀, „

Plate IV.

Fig. 7. *Mylothris lorena* ♀, upperside.
8. *M. malenka* ♀, „
9. *M. pyrrha* ♀, underside.
10. *M. pyrrha* ♀, upperside.
11. *Heliconius numata*, upperside.
12. *Hesperocharis hirlanda*, underside.

Plate V.

Fig. 13. *Pereute leucodrosime*, underside.
14. *Heliconius melpomene*, „
15. *Papilio zocynthus* ♀, upperside.
16. *Euterpe tereas*, „
17. *E. bellona* ♂, „
18. *Heliconius erato*, „

In all the Figures

a, precostal red patch on the base of the hindwing underside.
b, costal „ „ „ „
c, median „ „ „ „
d, internal „ „ „ „
e, costal light streak.
f, central pale area.
g, *i*, anterior dark shades.
h, posterior dark shade.
k, diagonal dark bar of forewing.
l, dark bar of forewing parallel to inner margin.

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IV. *The Rhynchophorous Coleoptera of Japan.* Part IV.* *Otiorhynchidæ and Sitonides, and a genus of doubtful position from the Kurile Islands.* By David Sharp, M.A., M.B., F.R.S., etc.

[Read February 5th, 1896.]

Although the collections of *Coleoptera* made by Mr. Lewis in Japan are of great interest, and are the base of almost all that we know of the *Rhynchophora* of Japan, yet it is, I think, tolerably certain that as regards the *Curculionidæ* proper—as distinguished from *Anthribidæ*, *Scolytidæ*, and *Brenthidæ*—they are very incomplete, and I am inclined to believe that the *Otiorhynchidæ* of Japan will prove to be twice or three times more numerous in species than the lists made from Mr. Lewis's collections will show.

Under these circumstances it appears scarcely worth while to discuss the question of geographical distribution, particularly as our knowledge of the *Rhynchophora* of China, of Korea, of Mongolia, and the region round the mouth of the Amur, is very small indeed. I may, however, remark that the Japanese *Otiorhynchidæ* have very little affinity with those of the European region. I here enumerate fifty-eight species belonging to twenty-six genera. Not one of the species is the same as an European one; while of the twenty-six genera fifteen appear at present to be peculiar to Japan, and only five have representatives in Europe, and of these five it is tolerably certain that four will prove to be more characteristic of Eastern Asia than of the palæarctic region proper. The genus *Otiorhynchus* is the most characteristic genus of the Mediterranean Curculionidous fauna, where it has altogether nearly six hundred species; but it is not represented in Japan. Indeed, the only points that appear to give this section of the Japanese fauna any claim to connection with the European one is the existence of a considerable number of species of

* Part I., see the Transactions for 1889; Part II., Transactions, 1891; Part III. (by W. F. H. Blandford), Transactions for 1894.

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Phyllobius in each, and the possession by Japan of a species of *Scythropus* allied to the European *S. mustela*.

I very much regret the delay that has occurred in the preparation of this paper, which was commenced several years since; and also that I shall not be able to continue the work for some time to come. But I hope that Mr. Lewis, who besides forming his splendid collection, has himself done so much towards working out the insects he procured, may be able to complete our knowledge of the *Curculionidæ*.

OTIORHYNCHIDÆ.

This term I use in the sense of Leconte and Horn, classification of Col. of N. America, 1883. It is very different from the Otiorhynchides of Lacordaire. I have, however, admitted an exception in the case of the genus *Meotiorhynchus*, which does not possess the scars on the mandibles, that is the special character of the family *Otiorhynchidæ*, according to the American taxonomists. I adopt two divisions, *Otiorhynchidæ apteræ* and *O. alatæ*, which, practically, are almost equivalent respectively to the Divisions I. and II. of the N. American writers, as explained in the Biol. Centr. Amer., Col. IV., pt. 3, p. 87.

OTIORHYNCHIDÆ APTERÆ.

This division was not recognized as distinct from the winged forms by Lacordaire, consequently its members were distributed throughout the Brachyderides and Otiorhynchides of the Belgian naturalist in so complex a manner as to render the application of his nomenclature to the divisions proposed by Leconte and Horn almost impossible. At the same time I do not know enough of the forms dealt with by the American naturalists to enable me to judge whether the Japanese wingless Otiorhynchidæ would enter satisfactorily into their divisions, and I therefore adopt the plan of arranging the sixteen genera that have been discovered in Japan in the following manner;—

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1. Thorax with ocular lobes. Group I. *Ophryastina; Pseudocneorhinus* and *Calomycterus*.
1'. Thorax without ocular lobes.
2. Scrobes lateral, elongate, directed inferiorly, so that their lower margin passes to the under edge of the rostrum without being directed towards the eye.
3. Front margin of thorax with a few hairs (vibrissæ) directed forwards under and behind the eye. Group II. *Copanopachys, Meotiorhynchus, Piazomias, Scepticus*.
3'. Front margin of thorax without vibrissæ. Group III. *Amystax, Blosyrus, Catapionus, Trachyrhinus, Trachyphlæosoma*.
2'. Scrobes lateral, not directed inferiorly, but towards the eye. Group IV. *Episomus*.
2''. Scrobes more or less superior and foveiform. Group V. *Myosides, Arrhaphogaster, Asphalmus, Omoiotus*.

GROUP I.

Pseudocneorrhinus.

Pseudocneorrhinus, Roelofs, Ann. Soc. ent. Belgique, xvi. (1873), p. 177, and *op. cit.*, xxiv., 1880, p. 10.

The position this genus should occupy is in the *Ophryastina*, where it will form a division separated from the American forms by the connate claws. Mr. Roelofs first placed it in the *Leptopsides*, of which the *Ophryastina* formed, according to Lacordaire, a separate division. With *Trachyphlæus* the genus has but little affinity, as it possesses well-marked ocular lobes, connate claws, and very deep scrobes.

1. *Pseudocneorrhinus bifasciatus*, Roelofs, C.R. Soc. ent. Belg., xxii., p. liii, and Ann. ent. Belg., xxiv., p. 12.

This is distinguished from its congeners by the very rotund form of the elytra, which are almost circular in their outline; the antennæ are very short; and the upright setæ on the elytra are fine, short, and minute.

Main island; Osaka, 14 July, 1881, Hakone, Miyanoshita, Kuwada, Kawatchi.

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2. *Pseudocneorrhinus obesus*, Roelofs, Ann. ent. Belg., xvi., p. 177, pl. iii., fig. 10, and xxiv., p. 11.

The individuals of this species are the largest of the genus; the elytra are broad and very convex, and in outline are intermediate between *P. bifasciatus* and *setosus*; the erect setæ are much larger than in *P. bifasciatus*.

P. obesus appears to be scarce, but altogether Mr. Lewis has obtained ten specimens; the only localities I can record for it are Kiga and Miyanoshita, on the Main island.

3. *Pseudocneorrhinus setosus*, Roelofs, C.R. ent. Belg., xxii., p. liii., and Ann. ent. Belg., xxiv., p. 12.

Closely allied to *P. obesus*, but rather smaller and considerably narrower, and with the erect scales on the elytra broader than in either of the congeners.

Kiushiu and Main islands; Ichiuchi.

4. *Pseudocneorrhinus minimus*, Roelofs, C.R. ent. Belg., xxii., p. liii., and Ann. ent. Belg., xxiv., p. 13.

This comes near to *P. obesus*, but the individuals of that species are the largest, those of *P. minimus* the smallest, of the genus: besides this, the antennæ are considerably shorter in *P. minimus*.

Roelofs described the species from two specimens ound by Mr. Hiller. In his recent journey Mr. Lewis captured four examples.

Main island; Kawatchi, Yokohama.

Calomycterus.

Calomycterus, Roelofs, *op. cit.*, xvi., p. 175.

1. *C. setarius*, Roelofs, *l. c.*, pl. iii., fig. 9.

A remarkable and apparently very rare species for which I am not able to record any exact locality.

GROUP II.

Copanopachys.

Copanopachys, Roelofs, Ann. Soc. ent. Belgique, xxiv., 1880, p. 7.

1. *Copanochys tigrinus*.

Piazomias tigrinus, Roelofs, Ann. ent. Belgique, xvi., 1873, p. 161; *C. tigrinus*, Roelofs, *op. cit.*, xxiv., 1880, p. 7.

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About twenty examples of this species were found at Hakodate: most of them agree with M. Roelofs' descriptions satisfactorily; but five of them belong to a well-marked variety, in which the upper surface is almost uniform pallid grey, the maculation of the elytra and thorax being nearly absent. Scarcely any two specimens of the type-form agree exactly in the maculation.

2. *Copanopachys griseus.*

Piazomias griseus, Roelofs, *op. cit.*, xvi., 1873, p. 162; *C. griseus*, *id.*, xxiv., p. 8.

I have before me about a score of examples that I refer to this species, though they vary enormously in colour, greatly in size, and somewhat in minute structural characters. All, however, differ from *C. tigrinus*, in having the eyes more convex, and the front tibiæ not in the least dilated externally at the apex. One of them in colour exactly resembles the typical form of *C. tigrinus*, while on the other hand, the smaller examples are wonderfully like *Scepticus insularis*.

Main island; Enoshima, Kawatchi, Yokohama (in April), Kobè. One specimen from each locality. The others were all obtained during Mr. Lewis's earlier visits, and the localities have not been preserved, but, no doubt, all are from the islands south of Yezo, while *C. tigrinus* is—so far as we know at present—confined to that island.

MEOTIORHYNCHUS, n. gen.

Mandibulæ ad apices tranversim laminatæ; tibiæ anteriores apicibus dilatatis.

Mandibles at the apex, forming as it were a prominent lamina, the front edge of which is quite thin and the outer angle the most prominent part; without scar; nearly similar to one another: buccal cavity large, filled by the mentum. Rostrum short, scrobes definite and deep, lateral and descending. Antennæ short, scape broad at the extremity, 7th joint of the funiculus almost amalgamated with the club. Eyes oval, moderately distant from the thorax. Prosternum a little emarginate, front margin irregularly ciliate, the ciliæ below the eye longer, so as to form rudimentary vibrissæ. Metasternum short. Hind coxæ widely separated, the intercoxal abdominal process being broad and truncate. First and second ventral plates elongate, third and

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fourth quite short, together not so long as the second. Anterior tibiæ a little enlarged at the apex both internally and externally; hind tibiæ broad at the tip, with a large external space bordered both internally and externally by very short thick spines; third joint of tarsus normally lobed and densely pubescent beneath. Claws moderate, free.

This genus is a most anomalous one, and in the present condition of the classification of the *Curculionidæ*, its position must remain an open question; it could be placed quite satisfactorily in the *Otiorhynchidæ* were it not that no mandibular scar exists: the mandibles, indeed, are so formed at the apex, that no deciduous pieces could be seated on them; while their sharp front and prominent angles, may perhaps be found to be a functional substitute for the deciduous pieces. This structure of the mandibles, added to that of the tips of the hind tibiæ, distinguishes the genus satisfactorily from *Copanopachys*, which is unquestionably its nearest ally; the two genera possessing a great similarity of facies.

1. *Meotiorhynchus querendus.*

Elongato-ovalis, niger, fusco-griseo-squamosus, limbo irregulariter pallido; opacus. Long, 10–10½ mm.

Rostrum short and broad, rugose in front, with a deep channel on the middle; eyes moderately prominent; antennæ short and stout. Thorax rather long, curvate at the sides, obsoletely sculptured, covered with very small sordid scales, with an obscure channel on the middle. Elytra elongate, quite narrow at the base, where, however, they just exceed the width of the base of the thorax, thence becoming broader for about one-fourth or one-fifth of the length; acuminate at the apex, finely striate, covered with minute scales, which are of an almost uniform dark colour, except at the sides where they become more or less pallid, though in a very variable manner. Legs stout; apex of hind tibiæ very large.

Mr. Lewis procured a small series of this very interesting insect at Hakodate, in Yezo. One of the specimens is a very beautiful variety in which the upper surface is maculate, somewhat as in *Copanopachys tigrinus*, with numerous pallid marks, the scales that are almost uniformly dark in the typical form, being, moreover, metallic. This example is a little smaller than the others, and slightly different in outline, so that it may possibly prove to be of a distinct species.

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PIAZOMIAS, Schönherr.

1. *Piazomias velatus*, Chev.?

Piazomias velatus, Roelofs, Ann. Soc. ent. Belgique, xvi., 1873, p. 164.

I enter this in the Japan list, solely on the authority of M. Roelofs, who says of it, "Très commun au Japon." There are, however, no examples of it in the Lewis collection. Indeed, I have not yet seen any Chinese example of the genus that agrees with the Japanese exponents, and Chevrolat described the species from China.

2. *Piazomias lewisii*, Roel.

Piazomias lewisi, Roelofs, Ann. Soc. ent. Belgique, xxii., 1879, C.R., p. liii.

This species was not described in M. Roelofs' first paper on Japanese Rhynchophora, and I think it possible that it was this insect he alluded to in his first paper, under the name of *P. velatus*: in which case, the latter name should be withdrawn from the Japanese catalogue.

According to Mr. Lewis's collection, this is by no means a prominent insect in the Japanese Coleopterous fauna; he found a few specimens in the island Kiushiu, in April, and one at Kobè, on the south coast of the Main island.

SCEPTICUS.

Scepticus, Roelofs, *op. cit.*, xvi., 1873, p. 158.

1. *Scepticus insularis*, Roelofs, *l. c.*

This species has been found sparingly in various localities throughout the three islands, from Nagasaki to as far north as Sapporo.

GROUP III.

AMYSTAX.

Amystax, Roelofs, Ann. Soc. ent. Belgique, xvi., 1873, p. 159.

1. *A. fasciatus*, Roelofs, *l. c.*, p. 160, pl. ii., fig. 2.

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A few specimens only have been obtained of this species. It is apparently very variable, but the material does not enable me to decide certainly that there is more than one species. Two individuals (without exact locality) have the elytra longer, and narrower, of a very dark colour, and marked behind the middle with two separated spots instead of a fascia.

Kiushiu, at Nagasaki and Ichiuchi in April.

Blosyrus, Schönherr.

1. *Blosyrus japonicus*, n. sp.

Niger, fusco-squamosus, sordidus, antennis piceis, prothorace brevi, medio carinulato, elytris globosis, interstitiis leviter convexis. Long. 6½ mm.

Antennæ short, third joint scarcely longer than the second. Rostrum very short, not longer than broad, flat, with distinct angular transverse depression in front of the eyes. Thorax short and broad, very strongly transverse, rounded at the sides, with an obscure carina on the middle, most distinct in front; the surface squamose; with a few very minute shining granules. Elytra much broader than the thorax, convex and globose, with series of rather coarse punctures, the interstices broad, slightly convex, and set with very short setæ.

The sculpture and clothing in this insect are more or less obscured by the dirt with which the insect becomes covered. There is a longitudinal channel on the middle of the head in two examples; in two others it can scarcely be detected, perhaps owing to its being obliterated by dirt mixed with an exudation.

Awomori and Sapporo: four specimens.

Catapionus.

Catapionus, Schönh., Gen. Curc., vi., 2, p. 245; Roelofs, Ann. ent. Belg., xvi., p. 155.

M. Roelofs has examined the type species of this genus, and has informed us that the *C. viridimetallicus* of Japan is certainly congeneric with it. He has also called attention to some errors in Lacordaire's description of the genus, and has added three other species from Japan: I should certainly not have recognized Lacordaire's description of the genus as being applicable to

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these Japanese insects, had it not been for M. Roelofs' investigation. The genus is very closely allied to *Cneorhinus*, whereas Lacordaire places it in the Barynotides; but, as I see no reason to doubt the correctness of the conclusion M. Roelofs arrived at, I accept it; as also his decision that the other species he describes, as belonging to the genus should really be placed in it. The *Cneorhinus*? *nodosus*, Motsch., was not known to M. Roelofs, but it has been obtained by Mr. Lewis during his recent journey, and should, I think, also be associated with the other species of *Catapionus* at present. Although very different in appearance and in several details of its structure from the *C. viridimetallicus*, it is approached in so many points by *C. clathratus*, Roel., that I hesitate to make it a new genus.

1. *Catapionus nodosus.*

Cneorhinus? *nodosus*, Motsch., Études ent., ix., 1860, p. 21.

Dermatodes nodosus, Harold, Deutsche ent. Zeitschr., 1877, p. 359.

Nikko, Subashiri, Miyanoshita.

The species has been received by Mr. J. H. Leech from China (Kiu-Kiang and Ichang), and I have an individual in my collection labelled as being from Assam.

C. nodosus has the rostrum broader at the apex, and more angularly prominent on each side, the mandibles are shorter, and each elytron is strongly lobed at the base. Harold's subsequent reference of this insect to *Dermatodes* was certainly erroneous.

2. *Catapionus clathratus*, Roel.

Catapionus clathratus, Roelofs, *op. cit.*, xvi., 1873, p. 157.

This was described from a single specimen. In 1881 Mr. Lewis procured a small series of examples at Nagasaki, Kashiwagi, and Otsu, in the months of June and July. There is very little variation amongst them, though the species has been found in two of the islands.

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3. *Catapionus modestus*, Roel.

Catapionus modestus, Roelofs, *t. c.*, p. 156.

This is at present the rarest species of the genus. I have before me three examples found at Nikko and Shimonosuwa, on the Main island.

4. *Catapionus obscurus*, n. sp.

Niger, griseo-squamosus, plus minusve obscure fusco-variegatus; prothorace rugoso, medio obsolete sulcato; elytris interstitiis alternis paululum magis elevatis. Long. cumque rostro, 7–9 mm.

This is closely allied to *C. gracilicornis*, Roelofs, but is much smaller, and has shorter antennæ, with the third joint only about half as long. The rostrum is nearly parallel-sided, a little broader in front: the third joint of the antennæ is a little longer than the second; the club is black, in marked contrast to the other parts: the rostrum has, on the upper part, an indistinct lateral groove on each side, in addition to the vague median depression. The thorax is narrower in front than at the base, but little rounded at the sides, the base nearly truncate. Elytra with rounded shoulders and fine serial punctures.

Found during the month of August, 1881, at several localities in the centre of the Main island: seventeen examples.

5. *Catapionus gracilicornis*, Roel.

Catapionus gracilicornis, Roelofs, *op. cit.*, xvi., 1873, p. 157.

This was described from a single individual found at Hakodate; it appears to be the least rare of the species in the northern parts of the Archipelago.

Hakodate, Sapporo, Junsai, all in the island of Yezo.

6. *Catapionus viridimetallicus*, Motsch.

Cneorhinus viridimetallicus, Motsch., Études. ent., ix., 1860, p. 21; *Catapionus viridimetallicus*, Roelofs, Ann. Soc. ent. Belgique, xvi., 1873, p. 155.

Yezo; Hakodate, Sapporo: very common.

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Trachyrhinus, gen. nov.

Corpus rugosum, sordidum, sat elongatum, setis erectis parce vestitum. Scrobæ laterales, latæ. Antennæ scapo sat elongato setoso, apicem versus crassæ.

Distinguished from *Trachyphlœosoma* by the more elongate rostrum, with longer scrobes, and by the comparatively elongate form of the body. The mandibular scars are distinct, the scrobes are very broad, owing to the arching of their upper margin, which causes them to encroach a little on the upper face of the rostrum, but the general direction and position of the scrobes is that of the Brachyderides, rather than that of the Otiorhynchides: there are no ocular lobes or vibrissæ, the eyes are rather small, nearly circular not prominent. The nasal plate is extruded so as to form an abrupt prominence. Femora not dentate: claws small, not connate. Metasternum very short: second and third abdominal sutures extremely deep; second segment equal in length to the part of the first segment that lies behind the coxæ. Tarsi rather small: tips of hind tibiæ slender, minutely mucronate.

This insect has somewhat the facies of *Trachyphlœus*. It may be described as a connecting link between *Amystax* and *Trachyphlœosoma*. It differs from the former by the scrobes which are broader, attain the eye, and are somewhat visible from above. The abrupt prominence of the nasal plate is peculiar.

1. *Trachyrhinus sordidus*, n. sp.

Piceus, suboblongus, rugose sculpturatus, setosus, parcius obscureque squamosus; prothorace sat elongato, medio canaliculato. Long. 5, lat. 1¾ mm.

Antennæ obscure red, scape rather long, with very distinct erect setæ on the lower margin, 2nd joint rather long, 3rd a little shorter, 4–8 differing but little in length, the 8th slightly broader than the preceding, about as long as broad; club oval, moderately long and stout. Nasal plate small but peculiarly prominent, placed entirely in front of the antennal insertions: front of rostrum rather broad, rugose; eyes entirely lateral, rather distant from the thorax. Thorax nearly as long as broad, slightly narrower than the elytra, curved at the sides and a little narrowed behind, coarsely and very deeply rugose. Elytra rather narrow, very little narrowed in front, very coarsely sculptured, but covered with an exudation mixed with dirt, which obscures also the small scales; the erect setæ very distinct, slightly clavate. In the male there is a deep

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oblong impression on the metasternum and first abdominal segment: the apical ventral segment is prominent, and broadly but vaguely impressed. The female is of less elongate form, and has the breast unimpressed.

Nagaski, in April: a dozen examples.

TRACHYPHLŒOSOMA = (*Trachyphlœops*, Roel.), n. syn.

Trachyphlœosoma, Wollaston, Ann. Nat. Hist., iv., 1869, p. 414; *Trachyphlœops*, Roelofs, Ann. Soc. ent. Belgique, xvi., 1873, p. 165.

I can find very little to distinguish as species the St. Helena *Trachyphlœosoma setosum*, Woll., from the Japanese *Trachyphlœops setosus*, Roel., and as genera I can see no distinctions. It therefore becomes necessary to change the name of the latter species as being later. The genus has only a superficial resemblance with *Trachyphlœus*, next to which it is usually placed.

1. *Trachyphlœosoma roelofsi*, n. n.

Trachyphlœops setosus, Roel., *t. c.*, xvi., p. 166, pl. ii., fig. 5.

Nagasaki, in March: apparently very rare.

GROUP IV.

EPISOMUS, Schönherr.

Episomus, Schönherr, Disp. Meth., 1826, p. 126; Pascoe, J. Linn. Soc. Zool., xi., p. 163.

1. *Episomus turritus*.

Lagostomus turritus, Schönh., Gen. Curc., i., p. 613; *Episomus turritus*, Roelofs, Ann. Soc. ent. Belgique, xvi., p. 164.

This species has been, after several misconceptions as to its position, referred to Episomus. It may be probably separated as a distinct genus (with *E. mundus*), but this may be left undecided at present.

E. turritus appears to be a common insect in China, and is probably not rare in the Southern parts of Japan. One of Mr. Lewis's specimens is labelled "found only on Aralia maximowiczi." It is a very variable insect in colour, size, and, to a less extent in sculpture. I have it from various localities in China, including Kiu Kiang (Pratt) and Shanghai.

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2. *Episomus mundus*, n. sp.

Squamosus, subtus cretaceo-albidus, supra fuscus, utrinque late albido-plagiatus, apiceque albido, antennarum apice nigro; supra vage sculpturatus, haud tuberculatus. Long. 14 mm.

Slightly smaller than *E. turritus*, with more slender limbs, and at once distinguishable by the absence of tubercles on the elytra. The surface is very densely covered with extremely minute scales, and the system of coloration is more like that of *E. turritus* than of other species of the genus. There is a single very deep groove along the middle of the rostrum, but no lateral rugæ. The thorax has no transverse folds or grooves, and it is only obsoletely and sparingly rugose, but there is a broad longitudinal impression along the middle consisting of two parts separated on the disc. The elytra seen in profile, are at first flat or nearly so, but then rise greatly so as to be very convex; they are sculpture with series of irregular, large, not deep pits, separated only by quite small interstices. A single specimen only has been found of this elegant insect, it does not appear to be related to any species but *E. turritus*.

Yuyama, in Kiushiu, May 12th, 1881.

GROUP V.

Myosides.

Myosides, Roelofs, Ann. Soc. ent. Belgique, xvi., 1873, p. 164.

This genus comes near to *Cœnopsis*, from which it is distinguished by the larger interval between the eye and the scrobe, the former being placed also nearer to the thorax.

1. *Myosides seriehispidus*, Roelofs, Ann. Soc. ent. Belgique, xvi., p. 165, pl. ii., fig. 4.

Apparently not uncommon, about Nagasaki in March; two specimens were also met with on the Main island at Miyanoshita in April.

2. *Myosides pyrus*, n. sp.

Dense fusco-squamosus, subpyriformis, setis erectis tenuibus parce vestitus; elytris minus brevibus, basin versus fortiter angustatis. Long. 3½ mm.

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Antennæ piceous, with elongate scape. Rostrum moderately long, very densely squamose except on the very definite angular space that limits the nasal plate; the tip very distinctly broader. Eyes round, slightly prominent. Thorax short, not much more than half as broad as the elytra, densely squamose, but with minute setæ placed in punctures that are concealed by the squamosity. Elytra narrow at the base, but becoming much broader behind, convex, finely striate, very densely squamose, with erect, moderately long, slender setæ. Legs piceous, moderately long, setose and feebly squamose.

This little weevil somewhat resembles *Episomus* in its general form. By the expanded tip of the rostrum it differs considerably from *M. seriehispidus*, and approaches *Peritelus*. Probably a distinct genus should be established on it. The claws are not connate.

A single individual was met with at Nikko, Main island, in June.

Arrhaphogaster.

Arrhaphogaster, Roelofs, Ann. Soc. ent. Belgique, xvi., 1873, p. 163.

The affinity of this genus appears to be with *Phlyctinus*. It differs from *Celeuthetes* by the scrobes being anterior instead of lateral. From *Phlyctinus* it is distinguished by the scrobes being foveiform instead of linear. The claws are not connate. The scar of the mandible is not very large, but is distinct on the left side, less so on the right one.

1. *Arrhaphogaster pilosus*.

A. pilosus, Roel., Ann. Soc. ent. Belg., xvi., p. 164, pl. ii., fig. 3.

Yokohama, April 1880: rare; Roelofs, *l.c.*, records it from Hakodate on Yezo.

Asphalmus, gen. n.

Antennæ anteriores, scapo sat elongato. Rostrum brevissimum, haud pterygiatum. Femora dentata. Corpus setis tenuibus depressis vestitum.

The insect for which I propose this new genus is similar in appearance to the European *Omias bohemanni*, from which it is distinguished by the scrobes whose

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posterior part encroaches on the front of the rostrum, so that they are separated only by a prominent, somewhat narrow, space; by the dentate femora and by the body being clothed with depressed instead of erect setæ. From *Arrhaphogaster* it is distinguished by the smaller interval separating the scrobes above and by the dentate femora. The eyes are quite small, but rather prominent, and are placed far in front of the thorax. The latter is without trace of vibrissæ or ocular lobes. The prosternum is only about half as long as the notum, the coxæ being placed almost at its front margin. The metasternum is extremely short; the hind coxæ are very widely separated. The abdominal sutures are moderately deep. The tips of the hind tarsi are very slender. The claws are small, equal, connate. These characters bring the genus somewhat near to *Peritelus*, though the two are not all similar. The Japanese insect is distinguished by the form of the rostrum and scrobes, and the hair-like clothing of the body.

1. *Asphalmus japonicus*, n. sp.

Fusco-rufus, pube grisea depressa, parce vestitus; prothorace densissime, ruguloso-punctato; elytris profunde crenato-striatis, interstitiis convexis. Long. 4, lat. 2 mm.

Rostrum very short, eyes placed almost half-way between the front of the thorax and the base of the antennæ. Scape moderately long, sub-curvate, thickened from base to tip. Head densely punctured, sub-foveolate above the eyes. Thorax very densely, not coarsely rugose-punctate. Elytra convex, ovate, much broader than the thorax, with rather broad and deep crenate striæ, the interstices convex, and furnished with depressed pallid hairs. Ventral segments shining, with only distant and rather fine punctuation. Tooth of front femora quite distinct, of the hind almost imperceptible.

Of this distinct insect eight specimens were met with on the Main island at Shiba in Tokio, in May, 1880.

Omoiotus, n. gen.

Ex affinitate generis Otiorhynchi. Corpus parvum fere nudum. Femora omnia dentata. Scrobes magnæ, antennis superne parum late distantes. Oculi parvi, fortiter convexi. Tibiæ tenues, apicibus nullo modo dilatatis.

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The small weevil for which I establish this genus, has the facies of an *Omias*, such as *O. concinnus*, but it appears to be more closely allied to *Otiorhynchus*, of which it might form a sub-genus, were it not that the scrobes of the antennæ in their upper part encroach more on the front of the rostrum, and are consequently less widely separated than in *Otiorhynchus*.

Antennæ moderately long, scape slender at the base, much thicker at the apex, extending beyond the front margin of the thorax. The rostrum short, thicker at the apex, distinctly pterygiate, the true scrobes quite short and convergent, but the rostrum above them excavated, so that the front of the rostrum is in the middle comparatively narrow. Eyes small, very convex. Front coxæ almost imperceptibly separated. Mentum with a short peduncle, and not filling the buccal cavity. Mandibular scars small but distinct. Third and fourth ventral segments not very short. Front femur with a large tooth, middle and hinder with smaller teeth. Tibiæ slender at tips, the posterior with two excessively minute spurs at the lower angle.

1. *Omoiotus ovatus.*

Gracilis, testaceus, capite thoraceque dense punctatis, illo inter oculos foveolato; thorace elongato, elytris multo angustiore; his fortiter, regulariter, seriatim punctatis, interstitiis leviter convexis. Long. 4 mm.

Second and third joints of antennæ rather elongate, the latter a little the longer, slender. Rostrum and head very densely punctate, the former short, but little longer than broad, without nasal plate, with a small deep fovea between the eyes; these remote from the thorax, very prominent. Thorax rather long and narrow, slightly longer than broad, curved at the sides, a little broader at the base than in front; densely rather coarsely punctate, rugose at the sides but not along the middle. Elytra rather slender, ovate, the series of punctures remarkably regular, each puncture rather large, the interval between each and the next very small: the interstices extremely regular, and bearing some minute depressed hairs; the series of punctures are ten, the outer one being placed very near to the margin, and obsolete behind. Ventral segments shining, almost smooth.

Two specimens were found, but the exact locality has not been recorded. This little insect is of considerable interest owing to its great approximation to the European

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genus *Otiorhynchus*. It is, in fact, all that has been discovered in Japan to represent the great genus that has several hundred species in Europe.

OTIORHYNCHIDÆ ALATÆ.

The Japanese species of this division are not very numerous, but it is probable that a good many others remain to be discovered.

There is but little difficulty in distinguishing the genera. These are eleven in number, and may be tabulated as follows:—

Prothorax without ocular lobes or vibrissæ.	
Claws connate.	
Scrobes visible from front.	
Rostrum with prolonged front angles . .	*Diallobius.*
„ simple, as usual at tip	*Phyllobius.*
Scrobes entirely lateral	*Scythropus.*
Claws free.	
Scrobes widely separated.	
Antennæ longer than the body	*Eumyllocerus.*
Antennæ not longer than the body.	
Second joint of antennæ short . . .	*Macrocorynus.*
„ „ „ long	*Myllocerus.*
Scrobes separated on upper surface by only a small space.	
Rostrum with a recurved process at tip .	*Anosimus.*
„ without „ „ „ .	*Hyperstylus.*
Prothorax with vibrissæ or ocular lobes.	
Prothorax with vibrissæ but not lobes . . .	*Chlorophanus.*
„ without vibrissæ, but with lobes.	
Rostrum rather slender, broader at tip . .	*Phytoscaphus.*
„ thick, not broader at tip	*Canoixus.*

PHYLLOBIUS, Germar et Auct.

The Japanese species of this genus appear to be numerous, and I have no doubt others will have to be added to those here mentioned.

The species are far from being closely allied to those found in Europe, though the existence of the genus in Europe and Japan, and its representation in each of the two provinces by numerous species, is the chief character that could be cited as evidence of an affinity between the Otiorhynchid faunæ of Europe and Japan.

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1. *Phyllobius longicornis.*

P. longicornis, Roelofs, Ann. Soc. ent. Belgique, xvi., p. 166.

The male of the insect I identify as this species, has the trough, or gouge-shaped depression, on the terminal ventral plate very deep, and the preceding two segments are more or less deeply, broadly impressed; the first abdominal segment is only slightly impressed on the middle, and the metasternum has no angular prominence on either side of the median impression. The front tibiæ have only a slight sinuation of the inner margin below the middle; the hind tibiæ have a very feeble concavity of the inner face of the apical part. The head has only a slight swelling of the surface posterior to the eyes. The antennæ are very long; the upper surface of the insect is rather densely covered with minute green scales, and there is no long pubescence.

M. Roelofs did not at first distinguish between this species and *P. prolongatus*, and most of his specimens in the Lewis collection belong to the latter species. Altogether I have examined eight specimens of *P. longicornis*: the localities are Nikko, Yokohama, Oyama, and Miyanoshita, on the Main island; Hakodate in Yezo.

2. *Phyllobius prolongatus.*

P. prolongatus, Motsch., Bull. Soc. Moscow, 1866, i., p. 180.

I accept, as representative of this species, an individual in Mr. Lewis's collection, determined by one of the German authorities who examined Herr Hiller's Japanese Coleoptera.

P. prolongatus is closely allied to *P. longicornis*, and is densely covered with golden-green scales, but has the male characters much less remarkably developed, the depression of the last ventral plate being comparatively slight, and the preceding two segments being simple; the tooth of the front femur is considerably smaller, and all the femora are less swollen. In the female the ventral segments are more bare than they are in *P. longicornis*.

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I have seen twenty specimens of this species; they vary a good deal in colour and in the vestiture. Most of the series were procured at Nikko, but the species was also met with at Miyanoshita, Higo, Bukenji, Oyama, and Awomori.

3. *Phyllobius armatus.*

P. armatus, Roelofs, Ann. Soc. ent. Belgique, xviii., C.R., p. cxxviii.

This species was described by M. Roelofs from a single pair, found by M. Van Volxem, and was not represented in the first collection made by Mr. Lewis. I refer to the species six examples found by Mr. Lewis at Nikko, Tokio, and Oyama. The insect is rather more robust, and has a broader after-body than its allies, and is distinguished, in addition to the remarkable characters of the male, by the conspicuous, soft, upright pubescence with which the body is clothed. In addition to the remarkable structure of the male front tibiæ, described by M. Roelofs, it should be noticed that the hind tibiæ have a slight excavation on the apical portion of the inner face, that the metasternum and first abdominal segment are impressed, but that the apical ventral segment is not trough-like, but vaguely irregularly impressed. It is not noticed in M. Roelofs' description that the antennæ are in larger part black, and that there is a vague, denuded black stripe, along the side of each wing-case.

4. *Phyllobius annectens*, n. sp.

Gracilis, niger, viridi-squamulatus, pube laxa, erecta, minus dense vestitus; antennis elongatis, tenuibus, ex parte rufis. Long. 8–9 mm.

This is allied to *P. armatus*, and is distinguished from other species, except the one mentioned, by the erect, soft pubescence clothing the body. The front tibiæ of the male are like those of *P. armatus*, but are more slender; while on the other hand the hind tibiæ are more evidently dilated at the tip, and more deeply emarginate on the inner face. The abdominal characters of the male are like those of *P. armatus*, but the apical ventral plate is more regularly depressed in a longitudinal

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manner along the middle. The female may be distinguished from the same sex of *P. armatus* by the narrower form, the absence of a denuded stripe on the side of the wing-case, while in general appearance it is intermediate between the species named and *P. longicornis*.

Nikko and Kashiwagi, in June.

5. *Phyllobius rotundicollis.*

P. rotundicollis, Roelofs, Ann. Soc. ent. Belgique, xvi., p. 167.

This remarkable species is distinguished by the peculiar ashy or cinereous clothing of the upper surface, which has a more or less indistinct metallic shimmer, but is entirely absent from a broad stripe on the side of the wing-case: the clothing is more like hair than scales. The eyes are very convex, and the head above them is much swollen. There is great difference between the sexes. The apical ventral segment of the male is broadly and deeply impressed, and the segments in front of it are also more or less impressed, as well as the hind part of the metasternum. The teeth on the femora are elongate and spiniform.

P. rotundicollis is apparently a rare insect, and has only been met with at Nagasaki. It occurs in early spring: April 12th, 1881.

6. *Phyllobius nigritus*, n. sp.

Nigricans, haud squamosus, pube tenuissima erecta parce vestitus, pedibus antennisque rufo-obscuris, his tenuibus, perelongatis. Long. 7 mm.

This species differs from the other Japanese Phyllobii hitherto brought to light by the absence of scales or coloured hairs, resembling in this respect the European *P. oblongus*, to which, however, it is, in other respects, but little allied. The antennæ are as slender as those of any species I have seen of the genus, and are also very long; the club is particularly slender, and is acuminate. Head coarsely rugose, inflated above the eyes, depressed between these, which are very convex. Thorax very densely rugose-punctate, opaque. Elytra with very regular series of punctures, the interstices slightly con-

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vex; the very fine hair is quite short in front, but on the apical part is longer and more conspicuous. The femora are each armed with a remarkably prominent tooth, that on the middle and hind femora being more abrupt and spine-like than usual.

The male differs much from the female, being of more long and slender form, with the antennæ somewhat longer and the femora more inflated. The breast and the first ventral plate are depressed in the middle, and the terminal ventral segment is broadly, rather deeply impressed; there are slight depressions on the penultimate and antepenultimate segments.

Hitoyoshi in Kiushiu, May 8th, 1881: a small series.

[*Phyllobius picipes.*]

P. picipes, Motsch., Études ent. ix., p. 20 (1860); Desbrochers, Abeille, xi., 1873, p. 660.

Motschoulsky's description is of little importance, but he remarks that the species is 4–5 mm. long, that it resembles *P. argentatus*, and that the eyes are "subprominuli." Desbrochers' description was made from a specimen sent by Motschoulsky to Jekel; and of this Desbrochers says that the eyes are "très-saillants, très-détachés." This renders it clear that Motschoulsky mixed together at least two very distinct species—the prominence of the eyes being of very great importance in the Japanese Phyllobii—and I think his name should be consigned to oblivion.

7. *Phyllobius japonicus.*

Minor, niger, sat dense viridi-squamosus, pedibus antennisque rufo-obscuris, his clava nigra. Long. 5 mm.

? *Phyllobius japonicus*, Faust, Stett. ent. Zeit. l., 1889, p. 221.

Distinguished from the other species by smaller size, and by stouter, less elongate antennæ, as well as by the almost total absence of external sexual distinctions. The clothing consists of minute, brilliant green scales, which, however, are not closely placed, and of short pubescence, which is fine and not erect, and therefore inconspicuous. The eyes, though strongly prominent, are not so much so as in the various preceding species. The form of the

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rostrum and scrobes is that of *P. calcaratus*. The scape is strongly bent, moderately long and stout, the club rather short; there is no swelling over the eyes. The thorax is small, much narrower than the elytra, nearly straight at the sides. The elytra are rather long and narrow, and have no denuded lateral stripe. All the femora are dentate, the tooth being rather broad and short; the hind tibiæ are somewhat cut away on inner face of their lower half, and this part is minutely crenate or tuberculate.

Kashiwagi, in the southern part of the Main island, June 20th, 1881 : a small series.

Two females have no metallic coloration, the elytra being covered with a fine pubescence somewhat as is *P. nigritus*. I consider them to be only a variety of *P. japonicus*.

P. japonicus was described by Faust from a single example, said to be of the female sex. It is not quite clear from the description that it is certainly this species, but I cannot reconcile Faust's description with any other, except this species.

8. *Phyllobius polydrusoides*, n. sp.

Squamulis læte viridi-micantibus dense vestitus ; antennis scapo in medio abrupte curvato, fere angulato. Long. 5 mm.

This is a very remarkable species, of which only one example has been found. It has the appearance of a *Polydrusus* more than of a *Phyllobius*, and the head has a marked angular prominence on each side over the eyes, much the same as in *Polydrusus pterygomalis*. The scape is short, nearly black, just before the middle abruptly bent, the outer part incrassate, the club short, and not acuminate. Rostrum very short, the scrobes not definite, but attaining the eye; this latter convex very remote from the thorax, the front of the rostrum quite flat. Thorax rather small and short, brilliantly scaled. Elytra covered with scales of a beautiful green colour, without any admixture of pubescence, the series of punctures quite distinct, the external one deeply impressed at the tip, and broader, so as to mark off there a sort of inferior margin. Legs black, clothed with some setæ, tarsi piceous. Femora each armed with a slender tooth, that on the anterior being minute.

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This species might be separated as a distinct genus. A sing'e example only was found at Kashiwagi, June 19th, 1881.

9. *Phyllobius incomptus*, n. sp.

Dense griseo-squamosus, in elytris maculis obscuris indistinctis subvariegatus, antennis rufis; femoribus vix incrassatis, dente minuto armatis. Long. 5½–6 mm.

This appears to be somewhat allied to *P. pomonæ*, though of a different colour and with a longer rostrum. The upper surface is densely covered with adpressed scales, without any mixture of pubescence: the scales are of a very pallid grey colour, and on the elytra are very faintly mottled by some irregularly distributed darker patches. The antennæ are unicolorous, pale red. The thorax is short only slightly curved at the sides, and a little narrowed towards the front. The elytra are rather long, become distinctly broader behind, and notwithstanding their dense clothing of scales have very evident punctate-striæ. The under surface is densely squamose. The legs are pale red, but much clothed with scales and setæ, there is a distinct tooth on the middle and posterior femora. I do not see any sexual differences.

Miyanoshita.

10. *Phyllobius leechi*, n. sp.

Dense griseo-squamosus, hand variegatus, antennis rufis; femoribus in medio leviter incrassatis, nec angulatis, nec dentatis. Long. 5 mm.

This is extremely closely allied to *P. incomptus*, but must be separated on account of the unarmed femora.

I have a single specimen from the late Mr. Pryer's collection, given me by J. H. Leech, Esq., and there is a specimen in Mr. Lewis' series of *Phyllobius* found by him at Kashiwagi on 16th June, 1881. The specimen from Mr. Pryer's collection has the antennæ considerably shorter than they are in *P. incomptus*, or in the example of *P. leechi* from Kashiwagi.

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Diallobius, n. gen.

Generis Phyllobii proxime affinis. Rostrum apice lato, pterygiatum, angulis anterioribus acutis, breviter recurvatis.

This genus has the facies of the densely scaled species of *Phyllobius*—*P. pomonæ*—*e.g.*, but the peculiar dilatation of the apical part of the rostrum, by which the scrobes are made anterior and entirely exposed in front, is diagnostic. The structure of the parts of the mouth appears to be much the same as that of *Phyllobius*, the mentum is, however, rather less slender, so that the maxillæ are not exposed; the minute labial palpi are, however, seated on the front of the mentum and quite free. There is no trace of either vibrissæ or ocular lobes.

The species of this genus seem to be of great rarity.

1. *Diallobius inornatus*, n. sp.

Dense argillaceo-squamosus, vix variegatus, antennis rufis, femoribus dentatis. Long. 4½–6 mm.

Antennæ rather stout, scape scarcely surpassing the front margin of the thorax. Club, rather short, oval, solid, but with the sutures visible. Rostrum very densely and evenly squamose, eyes rather large, scarcely prominent, separated by a long distance from the thorax, this latter short, slightly curved at the sides, and evidently narrower in front than at the base. Elytra very densely squamose, without any pubescence, the series of fine punctures very distinct notwithstanding the squamosity. Under surface also densely squamose, but the clothing is on the abdomen less perfect, on the apical segment there being merely hairs, or rather setæ, instead of scales. Legs rather stout, all the femora with a definite tooth.

Two specimens found by the late Mr. Pryer. The smaller specimen is probably the male.

2. *Diallobius mundus*, n. sp.

Dense squamosus, pallidus, subviridis, antennis rufis; femoribus intermediis et posterioribus fortiter dentatis. Long. 5½ mm.

Similar in appearance to the European *P. pomonæ* and allies; extremely densely covered with adpressed scales, of a pale colour, with a very slight tinge of green, and here and there slightly iridescent or metallic. In

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most other respects extremely closely allied to *D. inornatus*, the front femora are, however, though dilated and angular beneath, provided only with a very minute tooth. The legs are red, but on their anterior aspects are densely squamose.

I have seen only two specimens of this elegant insect. They were found in the Main island at Nikko and Kashiwagi in June. It should be noticed that Mr. Lewis found at Nikko a single immature individual of a species of *Phyllobius* that resembles *D. mundus* almost exactly.

3. *Diallobius lewisi*, n. sp.

Niger, minus dense viridi-aureo squamosus, antennis pedibusque rufis, illis clava nigricante; femoribus omnibus maxime dentatis. Long. 6½ mm.

A very remarkable insect, of which only a single specimen was found, it is a male; it differs greatly from the other two species of the genus, and bears in fact a relation to the first division of *Phyllobius*, similar to that exhibited by *D. mundus* and *inornatus* to the second division. Rostrum with the broad apical part very definite, not squamose, feebly bicarinate before the eyes. Scape of antenna nearly straight, broad at the extremity, 8th joint about as long as broad, club moderately long, acuminate. Eyes moderately large, but little prominent, encroaching somewhat on the front of the head. Thorax rather large, much rounded at the sides, only a little narrower in front than behind, sparingly covered with brilliant, hair-like scales, which do not conceal the sculpture, this consists of moderately coarse and close punctures, with the interstices dull, owing to a minute coriaceous sculpture. Elytra with rows of large punctures, black and shining, with brilliant hair-like scales. Legs very peculiar, the femora flat, with extremely large triangular acute tooth; tibiæ also compressed, so as to exhibit an edge externally, the lower part of each rather deeply emarginate, so that a sort of obtuse angle is formed above the middle. Under surface, shining, black, with very little clothing.

Kashiwagi, June 22nd, 1881.

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Scythropus, Schönherr.

1. *S. scutellaris*, Roelofs, Ann. Soc. ent. Belgique, 1873, p. 179.

Yokohama: four specimens. This insect is apparently really congeneric with the European *S. mustela*; it has, however, the front of the rostrum differently formed—as pointed out by M. Roelofs—and, in addition to this distinction, the remarkable fringe of setæ on the outside of the apical portion of the hind tibia is wanting in the Japanese species.

Macrocorynus, Schönherr.

1. *Macrocorynus discoidens*, Ol., Roelofs, Ann. Soc. ent. Belgique, 1873, p. 167.

This E. Indian species was not found in Japan by Mr. Lewis during his last visit. Previously the species was only met with at Kagoshima, so that it is probably confined in Japan to the extreme south.

Mylloceeus, Schönherr.

Six species of this genus, all peculiar to Japan, have been described by M. Roelofs, and I now add three others. *M. abnormalis* might, however, be placed in *Macrocorynus* with as much propriety as in *Myllocerus*.

1. *Myllocerus naso*, n. sp.

Densissime squamosus, brunneus, in elytris vage pallide-variegatus, capite inter oculos canaliculato. Long. 7 mm.

Very distinct from the other Japanese Mylloceri, and more closely allied to the Siberian *M. sibiricus*, Tourn.; readily distinguished by the structure of the apex of the rostrum; the depression of the nasal plate being much prolonged on to the rostrum, and forming above a very acute angle, surrounded by a remarkably deep and definite angular groove, which is prolonged as a fine smooth space along the middle of the rostrum, becoming more deeply impressed between the eyes, so as to form a short channel there. Scape long, rather densely setose, 2nd and 3rd joints of antenna very long, club elongate,

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acuminate. Eyes coarsely facetted. Thorax much narrower than the elytra, nearly straight at the sides, and almost as broad behind as in front, the base very feebly bisinuate; the surface squamose, but with a few large punctures, rendering it uneven. Elytra densely squamose, and with minute and very short setæ, rising from amoug the scales; the interstices a little convex, and the series of punctures quite distinct. Legs rather long, densely squamose, slender, hind femora with a distinct small tooth, the others almost imperceptibly dentate.

Higo, a Province in Kiushiu: one specimen.

2. *Myllocerus hilleri.*

Myllocerus hilleri, Faust, Stett. ent. Zeit., l., 1889, p. 222.

Minor, dense griseo-squamosus, variegatus, setis erectis armatus, antennis rufis, haud crassis, sat dense setosellis; femoribus dente parvo instructis. Long. 4-5 mm.

Antennæ not long, rather slender, 2nd and 3rd joints only moderately long, the 3rd scarcely so long as the 2nd. Rostrum flat in front, not carinate or impressed, eyes rather small, quite lateral. Thorax small, greatly narrower than the elytra, not in the least sinuate at the base, very slightly narrower at the base than in front; the surface densely squamose, the squamosity paler at the sides, the numerous setæ emerging from the squamosity very minute. Elytra extremely finely striate, the striæ not visibly punctate, densely squamose, the squamosity sordid grey, with some very irregular nearly white patches, and a few darker. The erect setæ very distinct. Legs slender, rather short.

This insect reminds one of the European *Pseudomyllocerus sinuatus*, but the claws are not connate. Amongst the Japanese species it can only be confounded with *Myllocerus griseus*, or *viridulus*, but is very distinct from them by the smaller thorax, smaller eyes, and by the very conspicuous setæ of the elytra. It also differs by the flat front of the rostrum, and by the extreme shallowness of the excision that forms the buccal cavity.

It was found in considerable numbers at Oyama.

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Notwithstanding some slight discrepancies with Faust's description, I have little doubt this is the species he had before him.

3. *Myllocerus* (?) *abnormalis.*

Compactus, dense squamosus, variegatus, antennis pedibusque crassis, dense squamosis, illis variegatis, tibiis compressis intus subdentatis. Long. 6 mm.

This insect is remarkable from the incrassate antennæ, and Otiorhynchus-like rostrum. The scape is broad, compressed, densely squamose and setose, brown, 2nd joint also brown, joints 3-7 stout, covered with white squamosity, 8-11 black, the last three forming a compact club. Rostrum broad at the tip, scrobes large, converging inwards abruptly, so that the prominent intervening space is but narrow; eyes large, rather prominent. Thorax rather large, deeply bisinuate at the base, narrowed in front, extremely densely squamose. Elytra densely squamose, in colour at the base as if scorched, on the middle pale, immediately behind the pale scales, a dark patch, the apical part coloured like the front of the body of a pale fawn colour: striation obscure on account of the squamosity. Legs very densely squamose, femora dentate. Under-surface densely clothed with pale squamosity.

Of this distinct weevil only one individual was procured. Hitoyoshi, May 5th, 1881.

4. *Myllocerus variabilis.*

Myllocerus variabilis, Roelofs, Ann. Soc. ent. Belgique, xvi., p. 168.

5. *Myllocerus castaneus.*

Myllocerus castaneus, Roelofs, p. 168, *t. c.*

6. *Myllocerus fumosus.*

Myllocerus fumosus, Faust, Deutsche ent. Zeitschr., xxvi., p. 261.

7. *Myllocerus nigromaculatus.*

Myllocerus nigromaculatus, Roelofs, Ann. Soc. ent. Belgique, xvi., 1873, p. 169.

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8. *Myllocerus griseus.*

Myllocerus griseus, Roelofs, *t. c.*, p. 170.

9. *Myllocerus elegantulus.*

Myllocerus elegantulus, Roelofs, *loc. cit.*

10. *Myllocerus viridulus.*

Myllocerus viridulus, Roelofs, *t. c.*, p. 171.

EUMYLLOCERUS, n. gen.

Ex affinitate generis Mylloceri; antennæ tenues, corpore paulo longiores; rostrum ad apicem vix incrassatum; oculi sat prominuli, a thorace subremoti.

The very elegant insect for which I establish this genus, is remarkable for its long slender antennæ. It is densely clothed with beautiful pale green-golden scales, somewhat after the fashion of *Phyllobius* and *Polydrusus*. The scrobes are visible from the front, and have no prolongation. The mentum and the emargination for its reception, are remarkably small; there is no trace of ocular lobes or vibrissæ. The legs are slender, the femora not dentate, the claws rather large, free. The hind coxæ less widely separated than in many of the allied genera.

1. *Eumyllocerus gratiosus,* n. sp.

Dense pallide viridi-squamosus, micans; antennis rufis, valde elongatis, clava elongata, gracile. Long. 6½–7 mm.

Scape elongate, slender, strongly curved, all the joints of the funicle very elongate, club slender, distinctly triarticulate. Rostrum very densely squamose, nasal depression elongate and narrow, a minute elongate fovea between the eyes, these moderately large, prominent. Thorax small, as broad in front as at the base, sides a little enlarged in the middle, base feebly bisinuate. Elytra subinflated, densely squamose, with numerous extremely minute pallid setæ in addition to the scales, finely striate, interstices broad, slightly convex. Scutellum long. Legs slender, nearly black, but with much pale green squamosity; tarsi paler, slender. Underside of head deeply trifoveolate, and with a fine transverse impression, passing from the outer fovea to the front of the eye.

Kioto and Kashiwagi, in the month of May: seven specimens.

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Hyperstylus.

Hyperstylus, Roelofs, Ann. Soc. ent. Belgique, xvi., 1873, p. 171.

1. *Hyperstylus pallipes*, Roelofs, *l. c.*, p. 172.

This elegant little weevil is very like a *Polydrusus*, but is distinguished by the scrobes being placed quite on the front of the very short rostrum.

Bukenji: one individual.

Anosimus.

Anosimus, Roelofs, Ann. Soc. ent. Belgique, 1873, p. 173.

1. *Anosimus decoratus*, Roelofs, *l. c.*, p. 174, pl. iii., fig. 8.
A. pallidus, Roelofs, *l. c.*

The species exhibits two distinct forms, which I believe are the sexes, the male having the tibiæ dilated and angulate on the middle of the inner margin, and the peculiar apical process of the rostrum more abruptly elevated and prolonged. I cannot distinguish *A. pallidus* as a separate species. Neither can I treat the genus as being provided with an ocular lobe on the prothorax.

Nikko and Hitoyoshi, in May and June: apparently very rare.

Chlorophanus, Germar, Auct.

Considerable difference of opinion has prevailed as to whether the peculiar chin-piece found in some members of this genus be a specific character or not. It is certainly a sexual character peculiar to the male sex, and occurring only in certain species of the genus. The females are characterised by the possession of an extremely long mucro at the extremity of the middle tibia; this sex is also provided with a peculiar structure, in the form of a very hard chitinous body, probably an ovipositor or piercing instrument, which, being frequently protruded, looks like an organ of the other sex; it is, however, bifid, whereas the œdeagus of the male is single

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and acuminate. The females of several species have the last ventral plate peculiarly formed.

1. *Chlorophanus grandis.*

C. grandis, Roelofs, Ann. Soc. Ent. Belgique, xvi., 1873, p. 162.

VAR. *lugubris*, n. var. Major, long. 15 mm., obscure fuscus, elytrorum vitta laterali fere nulla.

VAR. *metallescens*, n. var. Supra læte metallicus, prothorace distincte ruguloso; subtus pallidus.

A small series of this species was procured near Oyama, in May, 1880. Although the two varieties to which I have given names, seem at first sight very different from the type form, I feel sure that *lugubris* will prove to be connected with the usual state of *C. grandis*. I have seen only two examples of this form; they were also found at Oyama; a specimen found at Yokohama is apparently intermediate. Of the variety *metallescens* only a single individual was found, the locality being also Oyama; as the sculpture of the thorax is an important character, it may possibly prove to represent a distinct species, very closely allied to *C. grandis*.

2. *Chlorophanus planus*, n. sp.

Dilute viridis, pallide pulverulens, parum convexus, prothorace elytris que vitta laterale parum discreta flavescente; prothorace brevi, lateribus obliquis hand curvatis; elytrorum acuminibus minus elongatis; corpore subtus albido-viridescente. Long. 10 mm.

Pallid green, without metallic lustre. Antennæ quite short, their club reddish, the other joints black but with much white clothing. Rostrum short, a little narrowed towards the tip. Thorax not in the least rugose, base almost straight.

This species is readily distinguished from *C. grandis* by the characters mentioned above as well as by being only half the size, and by having the yellow stripe of the elytra extending over two interstices instead of one. The male has the chin-piece of the prosternum not perceptibly developed. The female has the tibial mucros much longer than they are in the male.

Nikko, June, 1880: five specimens.

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CANOIXUS.

Canoixus, Roelofs, Ann. Soc. ent. Belgique, xvi., 1873, p. 172.

1. *Canoixus japonicus*, Roel., *l.c.*, pl., iii., fig. 7.

This very remarkable insect has not been found again. It has little or no relationship with *Corrigetus*, though it has been suggested that it is possibly identical therewith.

The locality has not been recorded, but probably the insect was found at Nagasaki.

PHYTOSCAPHUS, Schönherr.

1. *Phytoscaphus ciliaris*, Roel., Ann. Soc. ent. Belgique, 1873, p. 176.

This is a true Otiorhynchid though its appearance suggests some doubt as to this fact. It was not met with again by Mr. Lewis on his last journey.

PTOCHUS ? ? OBSCURIPES.

Ptochus obscuripes, Motsch., Bull. Mosc., 1866, p. 180.

According to the description this is not a *Ptochus*, but belongs probably to the winged series of Otiorhynchides. It appears to me impossible to identify it from the description.

SITONIDES.

SITONES, Germar, Auct.

1. *Sitones japonicus*, Roelofs, Ann. Soc. ent. Belgique, xvi., 1873, p. 160.

Sitones is one of the most difficult of the genera of Coleoptera, the species being distinguished by slight and unimportant points. I think there is more than one species in Japan, but the material yet obtained is not sufficient for a certain conclusion on this point.

EUGNATHUS, Schönherr.

The position of this genus has been quite misunderstood. It is so close to *Sitones* that it is difficult to point to good characters for the distinction of the two; but I

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find that in *E. distinctus* the scrobes are more widely distant from the eyes than they are in *Sitones*.

1. *E. distinctus*, Roelofs, Ann. Soc. ent. Belgique, 1873, p. 179.

E. distinctus seems to be rather common in Japan, and varies greatly in size.

PARASITONES, n. gen.

Generis Sitonidis per affinis; corpus crassum, convexum, metasternum brevissimum.

I can see nothing to distinguish the species for which I establish this genus from *Sitones* except the short metasternum, and the comparatively short and convex form. I presume, from the rounded form of the elytra, and the absence of shoulders, that the species is apterous.

1. *Parasitones gravidus.*

Latus, convexus, niger, capite thoraceque parce setoso-squamosis; elytris griseo-squamosis, obsolete maculatis. Long. 6¼, lat. 3½ mm.

Antennæ short, obscure red, the club darker, 2nd joint rather shorter than the 3rd, club acuminate. Eyes rather large, a little convex. Rostrum short, closely and deeply rugose-punctate, deeply impressed along the middle, the depression broader in front; the sculpture only slightly obscured by the griseous setosity. Thorax rather large, not so long as broad, much rounded at the sides, base scarcely at all broader than the front; the sculpture remarkably coarse, only slightly obscured by the clothing, which is intermediate between setæ and scales. Elytra broad and convex, narrowed at the shoulders, so that the base is only very slightly broader than the base of the thorax, densely clothed with minute scales, which are griseous in colour, but varied with small darker spots, somewhat after the manner of *Liophlœus nubilus*, bearing also a few short, sub-erect setæ, most conspicuous on the apical part; they are striate, and the broad interstices are slightly convex on the declivity, the striæ are punctate, at the base the punctures become very large, but this sculpture is much obscured by the clothing. Under-surface black, sparingly setose.

Hakone: five specimens.

KUBILONUS, nov. gen. of doubtful position.

Mandibulæ prominentes, apicibus laminatis, rotundatis. Unguiculi liberi.

Mandibles prominent, and forming two laminate, rounded,

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divergent processes, without trace of any scar. Mentum very broad, but not entirely filling the buccal cavity, a narrow chink being left on each side; borne on a short very broad peduncle. Rostrum moderately long and broad, without nasal plate, scrobes exposed above in front, but afterwards lateral and descending, moderately broad and definite. Antennæ sub-terminal, funiculus 7-jointed, the 7th joint very abruptly separated from the club. Thorax elongate, without ocular lobes or marginal ciliæ; coxal cavities nearer to the front than to the hind margin. Front tibiæ produced internally at the tip, inner margin not denticulate. Middle coxæ slightly separated; mesosternal side-pieces sub-equal in size. Metasternum quite short. Hind coxæ not widely separated; first ventral segment behind the coxæ, only equal in length to the second, which again is but little longer than the third or the fourth, these two being almost similar. Hind tibiæ broad at the tip, but the outer margin is laminate, not cavernose. Tarsi pubescent beneath; claws rather small but not contiguous at the base.

This genus seems to be an extremely isolated one, and it would be very difficult to assign it a place in any of the divisions of Lacordaire, or of Leconte and Horn. I think it had better therefore form a distinct group to be placed between the Otiorhynchides and Cylindrorhinides. In appearance it is more like Otiorhynchidæ, than any other of the groups of Rhynchophora, and is, in fact, somewhat similar to an elongate narrow *Liophlœus*. The structure of the mandibles would on the N. American system, quite remove it from the Otiorhynchidæ, and I should myself take this view, were it not that in some species of the genus *Peritelus*—*P. senex, e. g.*, one of the sexes has the mandibles formed in a somewhat similar manner. The genus is, however, certainly not at all allied to *Peritelus*, and it seems almost equally widely separated from *Meotiorhynchus* in which an abnormal, and again somewhat similar structure of the mandibles exists.

Kurilonus insolitus, n. sp.

Elongatus, niger, elytris hispidis, setisque minutis depressis vestitis; antennis piceis. Long. cumque rostro 11–12 mm.

Antennæ moderately long, scape thicker towards the extremity, attaining the eyes but not passing beyond them; not squamose, but bearing a few long setæ; 2nd joint of funiculus quite as

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long as the 1st; club rather small, very compact, pubescent, acuminate. Rostrum narrower than the head, nearly twice as long as broad, strigose-rugose, unimpressed, with a fovea between the eyes, these moderately large, rather convex. Thorax rather longer than broad, rounded at the sides and considerably narrowed in front, covered with a peculiar dense intricate sculpture, with a narrow smooth space along the middle. Scutellum very short and broad, but quite distinct. Elytra elongate oval, base as broad as the thorax, shoulders not prominent; covered with a fine sculpture rendering the surface somewhat leather-like, and bearing, in addition to long erect setæ, some fine depressed setæ, representing scales: there is no trace of striation or punctuation. Under-surface destitute of scales; ventral segments quite shining sparingly punctate.

Mr. Lewis received five examples of this interesting insect from Ketoi one of the Kurile Islands, in 1881. It raises a lively desire to know something more of the insect fauna of these islands, of which we are at present in almost complete ignorance—at any rate, so far as the Coleoptera are concerned.

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V. *Notes on Flower-Haunting Diptera.* By George Francis Scott-Elliot, M.A., B.Sc., F.L.S., etc., communicated by Herbert Goss, F.L.S.

[Read February 19th, 1896.]

I have recently been engaged in writing a Flora of Dumfriesshire, and on beginning, it seemed to me advisable to make a new departure in several respects from the plan usually followed in such works, which is practically that of the late Mr. Hewett C. Watson drawn up in 1851. Amongst other points I have thought it necessary to observe insect visitors, and for this reason. The entire dependence of most flowers on their insect *clientèle* for fertilisation has been proved over and over again, and therefore it follows that to understand the distribution of species in any small area, it is necessary to know the insects which visit the species in that area. Moreover there are many theories at present abroad as to the origin of variations by natural causes, and as most botanical characters depend on those parts of the flower which are adapted to insects, the importance of a knowledge of these latter can scarcely be overrated.

Besides their importance in this respect, as being a possibly direct agency in the origin of variations in plants, insects must play an enormous indirect part in the isolation of flowers. If flowers of the same species are growing partly inside a sheltered and shady wood and partly on the bare ground outside that wood, it seems to me, from my own observations, that they will most certainly not be visited by the *same* insects. It is not improbable that a Bombus or hive bee, or possibly a butterfly, will visit both the forms outside the wood and those within it; but I do not think I am at all rash in saying that probably not 5 per cent. of those outside will be fertilised by pollen from those inside the wood, and *vice versa*. This means, for reproduction, nearly perfect *isolation*, and, therefore, just as we find in the case of oceanic islands, the formation of new varieties may proceed indefinitely.

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Diptera is extraordinary. I suspect the shelter afforded by these bays and valleys has much to do with this abundance.

Speaking generally, these flower-haunting Diptera appear to be far most frequent on plants which grow in enormous numbers wherever they do occur. Thus on *Spergula arvensis* I found *Syritta*, three species of *Platychirus*, *Rhingia*, *Empis vitripennis* and many *Anthomyia*, *Scatophaga*, etc. This was also the case on the common watercress, which is visited by *Volucella bombylans*, *Eristalis arbustorum*, *E. sepulchralis*, *Helophilus pendulus*, *Syritta pipiens*, *Platychirus clypeatus*, *P. peltatus*, *Empis livida*, and fourteen other Diptera and Coleoptera. On the more local and scattered *N. palustre* I only discovered three common Anthomyids.

Probably this explains why it is that so many plants have taken to contracting their inflorescence so that a very large number of flowers can be visited by insects in a very short time. Thus, of all the plants which I have studied, perhaps the following are the most visited by Diptera and other insects, viz., the dwarf elder, sheepsbit, *Umbelliferæ*, particularly *Cicuta* and *Angelica*, and of course the *Compositæ*, notably *Aster tripolium*.

On flowers which come early in the spring or late in the autumn, there is, in favourable weather, quite an extraordinary number of insects. I consider this to be probably due to the whole available insect force being concentrated on just those few forms which happen to be in bloom. The following list of visitors:—Hive bee, five species of *Bombus*, *Pieris napi*, *Eristalis pertinax*, *Sericomyia borealis*, *Platychirus albimanus*, *Syrphus balteatus*, *S. topiarius*, *Anthomyia radicum*,* would be at once supposed to belong to some very high type of flower, such as a *Labiate*, but in reality they were all caught on the common bramble or blackberry, which probably attracted them because the special bee-flowers were not then in bloom. Similarly the early spring buttercup or pilewort rejoices in a large number of guests, *e.g.*, Hive bee, *Mantua napi*, *Melanostoma*, *Platychirus albimanus*, *Empis punctata*, *E. bilineata*, *Hyetodesia basalis*, *Chilosia* sp., *Anthomyia* sp., and *Meligethes*.

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* By the author, Miss Hannay, and Mr. J. C. Willis.

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One point which comes out very clearly in many different cases is also illustrated by the buttercups. That is, that the water-loving forms of a genus, such as in this case *R. aquatilis* and *R. sceleratus*, are visited by perfectly extraordinary swarms of very low-class Diptera, while the guests of the land-forms though fewer in number, are of a much higher type (*e.g.*, *R. ficaria*, v.s.). These water species of a genus are also usually botanically less specialised than their land allies,* so that the specialisation of the insects and of their hosts has advanced together.

This corresponding rise in the scale of specialisation of guests and host together comes out very clearly in a variety of genera, and is strongly in favour of the correctness of the general theory to which I shall allude later on. Thus *Geum urbanum* is yellow and of a simple open type, and is visited by *Siphona geniculata*, *Hydrotea dentipes*, *Anthomyia radicum*, and *Hylemyia strigosa*.

Geum rivale is red and of a very much more complicated type, and this is visited by *Bombus muscorum* and *hortorum*, as well as *Rhingia rostrata*.

Epilobium angustifolium has also a larger, more tubular and one-sided flower than the ordinary willow herb *E. montanum*. Hence one finds upon it the hive bee and bumbles as the most regular visitors. (*Apis*, *Bombus lucorum*, *B. pratorum*, *Vespa sylvestris*, and *Cyrtoneura stabularis*).

The other only received the visits of *Syritta pipiens*, *Platychirus clypeatus*, *Siphona cristata*, and *Anthomyia radicum*.

The cloudberry, *Rubus chamæmorus*, is also either degraded or an earlier form of *Rubus* than the common blackberry, and hence it is not surprising that only a species of *Empis*, which Mr. Brunetti thinks is new to Britain, *Anthomyia radicum*, *Siphona cristata*, and *Hydrotea dentipes* were discovered upon it. Two very curious instances of the effect of structure of flower on insect visitor may be mentioned in this connection. *Corydalis*, a kind of poppy, belonging to one of the earliest

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* *R. sceleratus* has small petals, conical axis, etc., and *R. aquatilis* is white, not yellow.

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and least specialised orders, has a corolla closed like that of the peas, and its visitors are the regular pea-flower types, *Apis*, three species of *Bombus*, *Apathus*, and *Andrena*. The *Labiatæ* are, again, of all orders the most obviously adapted to bees, and the most constantly visited by them; for instance, of the fifteen flowers of this order observed by myself and friends, the visitors were invariably bumble bees and hive bees, except in one case,—*Mentha arvensis*,—where we found only *Scatophaga*, *Siphona*, *Hydrotea*, *Lophius*, and *Telephorus*. This flower is, again, a water-loving form, and also of very much simpler structure than any of the other plants of this order studied.

The flower-haunting Diptera are very much more important than most observers imagine in fertilisation. Thus such genera as *Galium*, *Myosotis*, some species of *Veronica*, and the smaller geraniums, particularly *G. lucidum*, appear to be chiefly dependent on *Syrphidæ* for setting seed. Now in Sir J. Lubbock's book, "Ants, Bees, and Wasps," these Diptera are somewhat markedly left out in the cold, so that a few facts, drawn from my experience, as to their colour, sense, and intelligence, may be of interest. I am obliged to admit that they are more frivolous than bees, and perhaps visit only three flowers in half an hour, during which time a *Bombus* might visit at least one hundred. On the other hand, they do not, as a rule, mix their honeys, but keep pretty steadily (though not so closely as a true bee) to one particular nectar. I have seen this particularly with *Empis vitripennis* when visiting *Linum catharticum*, which was growing along with many other flowers. It kept steadily to the *Linums* for a considerable time.

Their colour sense is quite clearly obvious from the following table. The most remarkable fact in it is, that not one of these sixteen Diptera is confined to yellow and white flowers. Sixty-one per cent. of the flowers visited by *Rhingia rostrata* are blue or red, and usually the white flowers visited are under 50 per cent. of the whole.

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	Number of Flowers visited.	White Flowers.	Yellow Flowers.	Red Flowers.	Blue Flowers
		Per cent.	Per cent.	Per cent.	Per cent.
Empis bilineata . .	8	50	25	...	25
„ *livida* . . .	10	40	10	30	20
„ *vitripennis* . .	6	50	17	33	...
Eristalis arbustorum .	9	67	22	...	11
„ *pertinax* . .	14	64	22	14	...
Melanostoma mellinum	9	45	33	22	...
Morellia hortorum . .	9	29	29	29	13
Omesia sepulchralis .	6	33	33	33	...
Platychirus albimanus	25	40	24	12	24
„ *clypeatus*	25	20	36	20	24
„ *manicatus*	15	54	6	40	...
„ *peltatus* .	15	47	13	27	13
Rhingia rostrata . .	13	23	16	46	15
Syritta pipiens . . .	21	67	24	9	...
Syrphus cinctellus . .	7	58	14	14	14
„ *ribesii* . . .	19	48	37	10	5
HYMENOPTERA.					
Bombus muscorum .	45	11	18	49	22°
Andrena albicans . .	8	50	37	13	...
Allantus nothi . . .	18	53	26	16	5

It thus appears that, though *Bombus muscorum* is far more red-loving than the higher Diptera, this is by no means the case for the smaller bees. There are in fact only four of the sixteen Diptera quoted, which are fonder of white flowers than *Andrena albicans* and *Allantus nothi*. The fact that blue and purple flowers, which are held by Müller and others to be particularly adapted to bees, and almost entirely fertilised by them, are very frequently visited by these Diptera, is particularly important. *Empis bilineata*, *Platychirus albimanus* and

° Miller gives for flies 67·9 per cent. white and yellow flowers and 30·3 per cent. of red and blue; for higher bees 36·6 per cent. white and 63·3 per cent. red and blue, *cf.* 29 per cent. white and 71 per cent. red and blue in this table; for small bees 63·8 per cent. white and 36·2 per cent. red or blue; while here it is 83 per cent. white and 17 per cent. red. "Alpenblumen," 1881, p. 512.

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clypeatus, are more blue in their tastes even than *Bombus muscorum*; and no less than ten of these sixteen Diptera habitually visit flowers of this colour. Very much the same deduction can be drawn with regard to their taste for red tints. *Platychirus manicatus* and *Rhingia* are nearly as fond of red as the *Bombus muscorum*, and only five out of these sixteen Diptera are less fond of red than *Andrena albicans* and *Allantus*.

If, in fact, we take the average colour-preferences of these sixteen Diptera, we find them to be as follows: Average of Diptera: 46 per cent. white; 23 per cent. yellow; 21 per cent. red; 10 per cent. blue; from which it clearly follows that these Diptera are of far more advantage to red and blue flowers than either *Andrena* or *Allantus*.

When, instead of taking colour in flowers as a base of classification, we look to complexity of structure; we find ourselves at once in a position of considerable difficulty. The structure of flowers cannot be easily brought into perfectly definite and unmistakable groups such as are furnished by the four colours already mentioned.

If we group flowers according to their natural orders, and tabulate insect visits to those orders, the result is quite meaningless, because plants belonging to the same order, or even genus, are in respect to insects of very different complexity. Thus, *Geranium sylvaticum*, *e.g.*, is visited by insects which bodily enter the open cup-like flower; while *Geranium lucidum* is visited by insects which stand on the petal and insert the proboscis into the narrow short tube. Hence I found on *Geranium sylvaticum*, *Apis*, *Bombus pratorum*, *B. muscorum*, *Halictus cylindricus*, *Nomada lateralis*, *Empis tessellata*, *E. pennata*, *E. vitripennis*, and sp., *Platychirus peltatus*, *P. manicatus*, and five *Anthomyidæ*, which could not be named. That is a very varied and extensive *clientèle*.

On *Geranium lucidum*, on the other hand, I only found *Syrphus cinctellus*, *Melanostoma mellinum*, *Platychirus manicatus* (though in great numbers); but no *Anthomyidæ* or Hymenoptera. This represents, of course, a very different set of visitors. The difference in *Leguminosæ* betwixt the small yellow trefoils and *Ornithopus* and the rest of the order is also most

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remarkable, and similar differences occur in almost all orders and more than one genus. Müller tabulates several orders with their visitors, and his example has been followed in this country by Mr. J. C. Willis and others.

However, as a rough classification, in order to obtain some insight into the intelligence of these Diptera, I arranged all the flowers which I have examined into six divisions :—

1. *Ranunculus* group, including all open flowers rich in pollen, into which any insect may enter bodily.

2. *Crucifer* group, including such forms as *Umbelliferæ, Galium, Alisma,* as well as all *Compositæ* with extremely short florets, such as, *e.g.,* Daisy.

3. *Veronica, Myosotis,* etc., *i.e.,* flowers with a distinct though short tube, and which involve higher intelligence in their clients than the preceding.

4. The long-tubed *Compositæ* such as *Carduus,* and also *Lychnis,* etc.

5. The smaller *Leguminosæ, Medicago, Ornithopus,* and *Trifolium procumbens.*

6. The larger *Leguminosæ.*

To these six classes I have added *Ajuga* (or *Euphrasia*), *Scilla,* and *Orchis.*

The result is expressed on the next page :—

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PERCENTAGES OF VISITS TO FLOWERS.

	Flowers visited.	Open, Class 1.	Cruciferæ, Class 2.	Veronica, Class 3.	Cardamine, Class 4.	Medick, Class 5.	Ulex, Class 6.	Ajuga or Euphrasia.	Scilla.	Orchis.
Empis bilineata . . .	8	25	37	25	13	...	...	...	...	...
„ *livida*	10	10	30	10	40	...	10	...	...	...
„ *vitripennis* . .	6	34	34	...	16	...	...	...	...	16
Eristalis arbustorum .	9	...	89	11	...	...	...	...	...	...
„ *pertinax* . .	14	14	50	...	22	...	7	...	...	7
Melanostoma mellinum .	9	56	11	11	...	11	...	11	...	...
Morellia hortorum . .	9	...	33	...	67	...	...	...	...	...
Onesia sepulchralis . .	6	...	50	...	50	...	...	...	...	...
Platychirus albimanus .	25	20	44	24	...	4	...	4	4	...
„ *clypeatus* .	25	8	24	28	16	8	12	4	...	...
„ *manicatus* .	15	27	27	13	33	...	...	...	...	...
„ *peltatus* . .	15	27	27	20	13	...	...	13	...	...
Rhingia rostrata . . .	13	31	23	8	23	...	...	8	7	...
Syritta pipiens . . .	21	5	86	5	4	...	...	...	...	...
Syrphus cinctellus. . .	7	15	57	14	...	...	...	...	14	...
„ *ribesii* . . .	19	16	48	5	21	...	5	...	...	5°

Now, if this is compared with the same Hymenoptera, we find:—

B. muscorum	45	20	2	5	22	...	27	24	...	...
Andrena albicans. . .	8	37	37	...	26	...	...	...	...	...
Allantus nothi . . .	18	11	55	11	11	...	6	6	...	...

° *Cf.* Müller, "Alpenblumen," Leipsig, 1881, p. 512.

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In words this may be translated to mean that these Diptera are, on the whole, more intelligent than the lower class Hymenoptera.

Three species of Diptera visit species of Orchidaceæ. In fact, *Syrphus ribesii*, *Eristalis pertinax*, and *Empis vitripennis*, appear to be the main agents in effecting the fertilisation of our common British forms. The only other insect which I have myself as yet discovered on these plants is *Argynnis aglaia*; my friend, Mr. Armstrong, however, reports that he has observed certain "large brown and sulphur moths" feeding on *Habenaria bifolia*.*

Nine of these Diptera are found either on the larger *Leguminosæ*, flowers of the Bugle type, or on Orchids; and this is sufficient to show a very considerable amount of intelligence.

It is not easy to bring these insects into any series which will show their relative ability, but judging from the preceding table, the following is a pretty sound grading of their intelligence:—

Class 1. *Bombus.*

„ 2. *Empis vitripennis, Eristalis pertinax, Syrphus ribesii.*

„ 3. *Empis livida, Melanostoma, Platychirus albimanus, P. clypeatus, P. peltatus, Rhingia, Allantus.*

„ 4. Remainder, including *Andrena albicans.*

It remains to point out the bearing of the foregoing remarks on the use of Diptera and other insect visitors.

I have not found any confirmation of certain theories which suggest that the actual probing of an insect's proboscis, or the friction of its feet have any influence in determining the growth of hairs, or the flow of sugar to that particular part of the flower;† it is, of course, probable that the continual draining away of nectar from a certain spot will induce a larger supply to come to that particular position, just as the continual use of a certain muscle will produce a greater enlargement of it. It is even probable that such a demand for nectar may be inherited, but this is not yet proved.

* I have taken specimens of *Leucania turca* in the New Forest with the pollinia of this species attached to their heads.—H. G.

† The researches of M. Kustenmacher on Galls, Bot. Gaz., xx., p. 497, are, so far as hairs are concerned, rather against this view, which is not, to my knowledge, supported by any direct evidence.

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On the other hand, I am far more certain of the dependence of flowers on insects than I was before. When such minute forms as *Draba verna*, *Subularia aquatica*, or such "typical wind-fertilised" species as the Burnet, Salad Burnet, and Dog's Mercury, and species of such genera as *Thalictrum* and *Plantago* are found to be visited by insects, as I have myself seen in the course of my work, it leads one to doubt if wind-fertilisation is ever of much use. A simple mathematical proof shows that the chances of a piece of pollen from one flower reaching that of another growing within a foot of it, is about one to three hundred; but if an insect is on one flower, for any purpose, the chance that it will go to the next visible flower is probably ten to one.

It seems to me that these Diptera will probably yield the most valuable results in investigating the origin of plant species, for they visit all kinds of flowers, and possess both colour-sense and intelligence, as I have tried to show. In fact, it is to them that we probably owe all the neatly made, small and bright-coloured forms which are particularly abundant in this country. It is not possible now to say definitely, that this or that insect is responsible for such a flower (though I think, myself, I could say it for certain forms); a genus in which seven species have been studied by us, and on which we have found hive bees and bumbles in all cases except two, would imply a very high botanical structure. Yet this genus is *Hypericum*, the flowers of which are very simple.

Still I think from my own experience, there can be no possible doubt either that the flower has modified the habits and structure of the insect, or that the insect has modified the habit and structure of the flower. Of the two, it seems to me, as a botanist, that the flower has been the predominant factor; but this opinion may be the result of prejudice.

NOTE.—Mr. G. H. Verrall, who has kindly looked through this paper, says that it is difficult to distinguish *Empis vitripennis* from about twenty closely allied species, several of which are yet unrecorded as British; that *Eristalis pertinax* has never been clearly differentiated in print, and that both *Syrphus cinctellus* and *S. ribesii* are very difficult to distinguish from numerous allied species.—H. G.

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VI. *Notes on Pupæ*—Orneodes, Epermenia, Chrysocorys, and Pterophorus. By Thomas Algernon Chapman, M.D., F.E.S.

[Read November 6th, 1895.]

Plates VI. & VII.

This communication is in continuation of my previous *Notes on Pupæ* (Trans. Ent. Soc. Lond., 1893–94). It refers especially to a character of certain pupæ, that occurs and appears to show a relationship in a large group of *Tineina*, and incidentally it deals with the plume moths, and some forms that have, or are supposed to have, affinities with them.

I may, in the first place, correct two errors in my previous papers; the most important of these, or at any rate the one for which I feel I am most to blame, is as to the free segments in the *Limacodidæ*. In the Limacodids, not only are segments (abdominal) 3, 4, 5, 6, free, but also 1 and 2, in the sense in which I now understand the word, that is, they are not soldered to the wings and appendages, and appear to be capable of independent movement on each other. It is extremely probable that the insect, however, never does so move them, and rarely, if ever, indeed, moves the others, being packed closely in and well protected by its cocoon. In explanation of my error, I may say that these two segments are so closely applied to the appendages, that when one separates them by traction in the living pupa one fears to tear the delicate pupa to pieces, and suspects that the separation is made by breaking down actual slight soldering—an occurrence which I have pointed out takes place very readily in those pupæ in which the process of fusion of the parts is in its early stages, the greater part, that is, of the lower "*Incompletæ*" in fact, such as Limacodids, Nepticulids, Adelids, etc. Then in the empty case all segments and appendages are so freely separate that this state of the pupa throws no light on the extent of soldering in the living pupa. The error is only of importance

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as showing that the Limacodids must take even a lower place than I had given them.

The other error was as to the structure of the pupa of the *Nolidæ*, due to my having only dead or empty pupæ. An examination of living pupæ shows that this pupa possesses only one free segment, viz., the fifth (abdominal), and is, therefore, probably in no way directly related to the *Macro-heterocera*. I hope to deal with this more fully in some future communication.

There is a pupal piece I have not hitherto referred to, having no clear idea as to its relationships, and have passed over as a portion of the anterior head cover (or face-piece), which no doubt it is. Nor have I studied it enough to know its range, except that it occurs chiefly in low micro forms. It is often a separate piece between the face-piece proper and the dorsal head-piece; it does not divide in the middle line on dehiscence, but remains in one piece. It is probably the dorsal-plate belonging to the antennal section of the head, as distinguished from the face-piece proper, which is the anterior plate or plates belonging to the mouth parts. Though it has no bearing on the subject of this paper, I take this opportunity of calling attention to it.

In my paper, read Feb. 22nd, 1893, I made it sufficiently clear that the section *Incompletæ* included the more generalised and ancient forms, and that the *Obtectæ* were more specialised and more modern. By putting this, however, into a tabular form, I believe I conveyed the impression that there was some sort of gulf between them, and what is especially erroneous, though much the same thing in another form, that the *Obtectæ* were more closely related to each other than any of them were to any of the *Incompletæ*, and this misapprehension was probably favoured by my taking the number of free abdominal segments as the most typical indication of the extent to which a pupa belonged to the more generalised forms. No doubt that is so, but the other directions in which fusion of parts (the character of *Obtectæ*) has failed to obtain, is also of importance.

The feature of an Incomplete pupa that is usually most persistent—that is, appears most frequently in the highest forms—is the presence of the portion, that I at one time supposed might be an anterior portion of the prothorax, but which I think there can be no doubt is the

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dorsal-plate of the head, or of the last segment of the head, viz., the one to which the eyes belong. This is present in no true butterfly, but is present in Skippers, and carries the eye-covers with it on dehiscence; it is to be found in a few families of the true *Macro-heterocera*, some Geometers, the *Thyatiridæ*, and the *Lasiocampidæ*, suggesting that amongst these we may find the lowest families of the macros, and their line of origin from the micros. Illogical and exploded as the terms macro and micro may be, I still think their retention useful for the present, in place of such periphrases as the more specialised and more generalised, etc., meaning by macro the higher *Obtectæ*, and by micro the lower *Incompletæ*, and describing intermediate families as possessing such-and-such macro or micro characters. In this connection I should like to allude to the extent to which I regard the *Tineina* as not being a homogeneous superfamily or family. So far as it is not a mere question of names—*i.e.*, what we shall call a family, and what a sub-, and what a superfamily, what a tribe, and so forth—but a question of fact, that is, of the amount of divergence between the several groups, then the pupal structure shows that there is a divergence between the *Gracilaridæ* (including *Lithocolletes*), the *Nepticulidæ*, and the *Argyresthidæ*, which is much greater than that between, say, any family of *Noctuina* and the *Notodontidæ*.

That this view is not without foundation is tolerably evident when we find Prof. Packard, whose authority on such a matter is of the highest, not merely dividing one genus of *Tineæ* (*Micropteryx*) into two families, which was all I had courage for, but erecting one of them (*Eriocephalidæ*) into a suborder, and the other as an equivalent to all the remaining families of Lepidoptera.

Being somewhat emboldened by this advance, and adopting Prof. Packard's conclusions on this point, and reviewing the apparent relationships of the most generalised forms of Lepidoptera, feeling also that we have not sufficiently realised the extent of our unacquaintance with very many forms that are required to bridge over the divergences that exist between even these earliest forms, an ignorance due to our not having met with them, not having learned their life-history so as to understand their positions, or, and most frequently no doubt, to their no longer existing, I would suggest that there

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were other families of *Palæolepidoptera* (Packard) besides the *Micropterygidæ*. *Hepialus*, and *Nepticula*, and possibly *Psyche*, being derived from *Palæolepidoptera*, without any intermediate forms that we now possess, and yet certainly not from the *Micropterygidæ*; and that the lines of evolution diverged from this low point.

Micropteryx unquestionably led directly to the *Adelidæ*, (*Prodoxidæ*, Packard) via *Incurvaria*, and thence to the great mass of the families of Tineina, including two at least of the families I have before me in this paper.

There happens to be one character (pupal) which first appears in the *Adelidæ*, and which may, I think, be taken as strong evidence that any family possessing it belongs to this series. This character is a remarkable narrowing of the prothoracic plate, and a great increase in the size, especially longitudinally, of the dorsal head plate (cephalothoracic piece). This conformation gives a very definite facies to all the forms that possess it to any decided degree, in consequence of a further fact, that is always more or less associated with it, though why it should necessarily be so is not very clear—this is, that the narrow ribbon of prothorax forms a depressed neck, and the head swells out in front, sometimes with quite a globular projection.

This series is especially the Tineid as distinguished from the Tortricid stirps, beginning with the Adelids and passing through the *Tineidæ*, with sundry branches, reaching in *Epermenia* the critical point in which it passes from the micro to the macro type. Having *Orneodes* as a definite and probably terminal form derived from this point, but passing on to the higher families that I have called Pyraloids, a term I desire to restrict to forms usually classed as Tineina, making the Pyrales a separate group, but including with them *Depressaria* and some other so-called Tineid families.

These Pyraloids include *Yponymeuta*, *Argyresthia*, *Plutella*, *Laverna*, *Elachista*, etc. All these are characterised like the Pyrales, and like the whole lower part of this stirps by the preservation of the maxillary palpi, not only in the pupa but also in the imago. *Coleophora* deserves separate consideration: it is not only equally high with these in having a generally obtect form of pupa (five and six only, free in both sexes), but is higher in

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having lost the maxillary palpi. It is, however, lower, in one sense perhaps higher, in having carried the characteristic peculiarity of the stirps to an extreme point, viz., the prothoracic plate is dwindled to so narrow a quantity, that in many species (I cannot, of course, answer for all) it is quite evanescent in the middle line.

For these and for the following reasons also, I am inclined to claim for *Coleophora* that it is derived from *Adelidæ* by a line of descent parallel to (and of course as long as) that of the Pyraloids, but quite separately at least from a very low point. I am too ignorant to be able to say that all intermediate representatives have been lost, but they have not yet been recognised by me. The other points of resemblance are especially that the somewhat unusual structure of the last segments of the pupa of *Coleophora* is almost identical with that of *Lampronia* and some other Adelids, of *Bucculatrix* and other of the lower forms. That it is a casebearer like *Adelidæ* is, of course, not without its significance, though it would not be difficult to believe this to be an independently acquired habit. Another important point of resemblance is in the ovipositing apparatus.

No doubt these are structures given to great variation and may differ exceedingly in closely related forms, but when we consider the remarkable specialisation of this apparatus in Adelids, and that this is practically lost in the Pyraloids, it seems impossible to believe that almost precisely the same apparatus would be again elaborated for a purpose that would be served by a much simpler structure equally well.

In *Micropteryx* the dorsal plates of the ninth abdominal segment form a cutting knife. In *Incurvaria* the dorsal plate of the eighth is partially modified for its support. In all the other *Adelidæ* I have examined, both dorsal plates are extremely modified (as described by Dr. Wood, Ent. M. M., vol. 27, p. 175), one as a knife and the other as a support. In *Coleophora* the structure is almost precisely the same, except that the horny knives of the Adelids, hard, sharp, and polished for cutting plant tissues, are in *Coleophora* rounded and furnished with tactile hairs, and are adapted for searching in inflorescence and for a nidus for the eggs, but not for cutting.

I may refer parenthetically to *Gracilaria* and *Lithocolletis*, which have advanced to the stage of having the

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first four abdominal segments fixed, retaining the normal armature and method of dehiscence of micros; they have the large head-piece characteristic of this series. They have also lost the maxillary palpi, so that they are not in the direct line to the Pyraloids and must be regarded as occupying a terminal position in that branch of the series to which they belong—and probably came from Adelids by way of *Tischeria*, missing *Tinea*.

One more immediate object in this paper has reference to the degree of relationship, or want of it, existing between *Orneodes* and *Pterophorus*. *Chrysocorys* also has long been associated with *Pterophorus* in our list, and as *Orneodes* and *Chrysocorys* both belong to this series with large head plates, it is necessary to refer to it thus in some detail. I have associated with them the genus (family) *Epermenia*, as it occupies a somewhat critical position in the series.

It is remarkable that the pupa with the free seventh segment of the male has so universally the habit of emerging from the cocoon. *Pterophorus* was for a long time the only exception I knew of. But *Epermenia* forms another. Since it may very naturally be supposed that I regard this unusual coincidence as evidence of alliance, I hasten at once to say that I think it has no such significance. The fact is that the habit and the structure appear to have always been lost together, except in the case of *Pterophorus* (and again in *Hepialus*, which is the reverse case); and the wonder is that there should not be more instances than that of *Epermenia*, in which we, as it were, surprise the change actually occurring, and find that the habit does cease a fractional time before the structure.

If we suppose *Epermenia*, which preserves the maxillary palpus, to lose the freedom of the male seventh segment, we have in essentials the pupa of these families, which I group together as Pyraloids, viz., *Elachista*, *Laverna*, *Asychna*, *Plutella*, *Argyresthia*, *Yponymeuta*, and some others. Pyrales differ little from these except in the much diminished size of the dorsal head-plate and, in the higher genera, in the appendages not projecting beyond the fourth abdominal segment. Still I have not yet quite satisfied myself that the Pyrales are really a continuation of this series.

Orneodes differs from *Epermenia* in losing the mobility

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of the seventh segment, but it loses also the maxillary palpus, so that it is not in the direct line of the Pyraloids, but a lateral branch.

Chrysocorys retains the same formula of free segments as *Tinea*, and has retained also the habit of emerging from the cocoon for dehiscence. It has, moreover, entirely modified and altered the dorsal armature of the abdominal segments which most forms that retain that habit preserve, and has in all its stages attained a very modified and isolated position.

Pterophorus presents as a pupa no point of connection at all near to any of these others. As to its relation to *Chrysocorys*, the pupæ of both belong to the forms with three free segments in the female and four in the male. This is, however, a very large group, and possesses forms as far apart as *Tortrix, Sesia, Cossus, Tinea, Simæthis, Castnia*, etc., and it is quite possible, perhaps even probable, as I have already suggested, these have more than one line of origin from lower forms, so that this does not go very far in showing relationship.

Pterophorus has acquired a habit which no other pupa in this section possesses, except *Hypercallia*, if it be a true Pyraloid—viz., it attaches itself by a cremaster and has no power of progression, and possesses no maxillary palpus. *Chrysocorys* has a small maxillary palpus, and possesses, in full vigour, the power of emerging from its cocoon. Especially perhaps it has a very decided and definite cocoon. I have not seen any *Pterophorus* cocoon anywhere near it. The most important point of all, perhaps, is that *Chrysocorys* has a very narrow prothorax and a fairly large head-piece, and belongs therefore to the *Tineid* stirps; the reverse being the case in *Pterophorus*, yet the minute trace of head-piece carries the eye-cover on dehiscence. As regards its panoply of hairs, spines, bristles, and other appendages, the different species of *Pterophorus* present immense variety, some being very smooth and plain and with a delicate shell, others most elaborately clothed with hairs and spines of various arrangements, but none are at all like *Chrysocorys* with its combination of hooked spines, recurved hairs, and projecting spiracles. *Acanthodactylus* has some resemblance to it, but it does not go beyond the possession of recurved spines on certain segments, not in detail at all like those of *Chrysocorys*.

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When we come to the larva, *Pterophorus* again presents very great variation from a nearly smooth larva to a very hairy one, and some species possess hairs with expanded tips essentially the same as those of *Chrysocorys*; but then such hairs, moderately developed, are found in very many families of Lepidoptera. The relations of the several tubercles to each other vary a good deal in *Pterophorus*, and, as I read Mr. Dyar's descriptions, there are one or two species with tubercles disposed as in *Chrysocorys*, by one and two (trapezoidals) and four and five (post ? and subspiracular) being almost united.

When we come to the egg, *Pterophorus* varies again here within wide limits, but there is not even a remote suggestion of the structure found in *Chrysocorys*.

These differences, whilst placing *Chrysocorys* nearer to *Pterophorus* than, say, *Orneodes* is, hardly admit of its being in the same family.

The peculiar cremaster of *Pterophorus* (an anal and a forward portion) is paralleled in *Elachista*, *Yponymeuta*, etc., which belong to the same series as *Orneodes*, but, though this may suggest that *Pterophorus* is after all, in spite of the small head-pieces, derived from this series, it will leave it as far from *Orneodes* as ever. Further, for instance, than *Coleophora* is from *Adela*. The great difficulty in placing *Pterophorus* anywhere near to *Orneodes* (though still at a considerable distance) or even to *Chrysocorys*, is the extremely reduced condition of the dorsal head-plate, so that it seems impossible to derive it from the Adelid series at all, even if one starts as low down as *Micropteryx* to allow for the divergence.

Though the true Pyrales preserve (largely) this head-piece, its reduced size places a difficulty in deriving them from Pyraloids, though there is obviously a long series of forms through which the reduction might occur gradually. The same difficulty faces an attempt to place any macros in this line, but these difficulties in the case of the Pyrales and Macros would be slight compared to attaching to the series so extreme a divergence so low down, as would be the case with *Pterophorus*.

Pterophorus might certainly fall under my definition of a "micro" whose larva is "an exposed feeder," and Dyar places it there along with *Anthrocera* and *Limacodes*, and both in structure and habits the larva falls into that division as readily as into any other; at any rate

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it is almost certainly not a member of the Adelid series, and if it be, it is certainly at a great distance therein from *Orneodes*.

A point to be especially noted is the extreme divergence between the pupa of *Pterophorus* and that of Pyrales.

Pyrales have a pupa that is a true macro in dehiscence, in possessing segments four and seven (abdominal) fixed in both sexes, and possesses no micro characters except a dorsal head-piece (a character that goes very high up), maxillary palpi, and in some families appendages projecting beyond segment four.

Pterophorus is a true micro in dehiscence, has segment four free, and seven free in male, the dorsal head-piece is evanescent, and it has lost the maxillary palpi.

It is impossible for one of these forms to be derived from the other, and impossible for them to have a common ancestor higher up in the series than *Tinea*, more probably that ancestor is much lower.

Orneodes has a pupa of Obtect formula as to free segments, and the dehiscence is of very nearly the macro type. Antennæ separating from head, and eye-covers remaining attached to face-piece. It retains one, and only one, very marked micro character, viz., the possession of a dorsal head-plate; not only so, but this plate is of immense size, whilst the prothorax is correspondingly reduced. Contrarily the pupa of *Pterophorus* retains most of the characters of a micro, the one that it has almost lost is this head-plate, which is nearly evanescent, although it retains the function of carrying the eye-cover on dehiscence.

Both have then been derived from the micro stirps, as we know, indeed, that all pupæ have been; but the routes have obviously been divided for so long a period that it is justifiable to describe them as in nowise related, less probably than any two families of macros.

I present figures of the eggs of the four genera referred to in this paper, chiefly on account of the fact that whilst those of *Orneodes*, *Epermenia*, and *Pterophorus*, present features that are frequent in many different families of Lepidoptera, that of *Chrysocorys* is so unusual.

The ova of *Orneodes* and *Epermenia* belong to the section with horizontal micropylar axis and rough sculpturing, characteristic of the stirps we have been considering. *Pterophorus* has a horizontal egg, but with

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sufficiently smooth surface to give some support to the idea that it belongs to the Zygænid stirps; whilst *Chrysocorys* has a vertical micropylar axis, throwing doubt on the position in which I have placed it. But the whole question of oval forms is too large to treat incidentally in this place.

I also present figures of the pupa of each genus, and also of their dehiscence, and of the remarkable hairs of the tubercles of *Chrysocorys* larva (omitted from plates).

In regard to the names, it appears that *Chauliodus* has to drop, but whether *Epermenia* or *Calotripis* is to take its place, I do not yet know. Nor am I at all satisfied that *Chrysocorys festaliella* ought not to be called *Schreckensteinia scissella*, but I am not trained in that line of research that would enable me to settle this matter.

A few details as to each family is appended.

Œnetodes.—The egg laid in the flower-heads of honeysuckle is about ·48 mm. long and ·28 mm. wide, somewhat cylindrical and truncate, or like a short thick brick with the angles and corners rounded off; the surface is sculptured with irregular raised lines and pits.

The young larva has dorsal tubercles arranged trapezoidally, one supraspiracular, two subspiracular, and two marginal, these persist during the life of the caterpillar; the skin is rough, with minute sharp spicules similar to those in *Epermenia daucellus*, and many other larvæ.

The pupa is brown, and noctua-like in general form and texture. It has only five and six (abdominal) segments free, and has the projecting knob-like head that occurs in most of the forms belonging to the series with a narrow depressed prothorax and a large dorsal head-piece.

The size of this dorsal head-plate in this pupa reaches the extreme that I have observed, and is, indeed, very remarkable. There are no labial or exposed maxillary palpi, and the dehiscence is quite macro in character, the antennæ separating from the face head parts, which remain attached to the eye-covers; the lower parts of the appendage covers remain *in situ*, and are only separated at the head. There is a femur case shown, and the second leg reaches the head. The maxilla and first leg fall short, and expose a portion of the third leg, between and beyond the second. The appendages project freely over the fifth and sixth segments.

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The anal armature consists of ten or twelve fine spines, little more than hairs, curved and crossing one another in lyre shape, and having a fine recurved flattened extremity. There is also a small bristle above and below each (exposed) abdominal spiracle.

EPERMENIA.—The eggs are ovoid, but rather long and narrow, being fully twice as long as broad, and rather narrower at one end; the surface sculpture is a raised network, somewhat irregular, but tending to be hexagonal, with the cells lengthened in the line of the long diameter of the egg. Many are often laid on the same leaf; but each egg appears to be laid solitarily, and it appears to be, when laid, very soft, as it takes the impress of the hairs of the leaf amongst which it is laid, and adheres to them very firmly.

The larva has two dorsal (trapezoidal) tubercles, a supraspiracular and a double subspiracular tubercle, one marginal, and three ventral (on legless segments). The tubercular plates are very large, and that of the supraspiracular in some degree surrounds the spiracle. There is a minute tubercle at the anterior margin of the segment in line with the posterior trapezoidal. The general surface is closely studded with sharp deflexed points, as *Orneodes*. The larva can hardly be called a miner, but tends to burrow something after the manner of the *Procridæ*. This is very marked in *E. daucellus*, very slightly so in *E. chærophyllellus*. The resemblance to *Simæthis* appears to be entirely superficial. The prolegs have sixteen hooks set in a circle, but more crowded along the inner margin; the anal pair have eleven or twelve hooks.

In pale brown colour and general outline the pupa resembles that of a noctua; the species I have examined, *E. daucellus* and *E. chærophyllellus*, are very much alike. They have the first four abdominal segments fixed, the next two free, and the seventh also, in the male; the appendage cases project across the fifth as far as the sixth segment, the incision between the fourth and fifth segments is sloping, the fourth segment being narrowed and the fifth widened dorsally, ventrally the reverse. The large dorsal head-piece and narrow prothorax are almost identical with those of *Orneodes*. The abdominal spiracles are on slight mammillæ, in very Pyrale manner. There are twelve slender, very curved, hooked hairs as

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an anal armature, seated on the last (nine and ten) segment, which has a bulbous base, a pen-like form and two deep hollows, one on either side. The maxillæ show between them a narrow opening with the labial palpi, traces of femur between maxilla and first leg, the second leg does not reach the head, the third leg is visible between lower end of antennæ, the second legs falling short by about one-seventh of the length of the appendages, and the maxilla and first legs by about another one-seventh; there is a small maxillary palpus.

The dehiscence is by splitting down dorsally to, but not through, the metathorax; the mesothorax separates half-way down the wings from the metathorax; the antennæ separate from the head and for a quarter of this length from the wings, but adhere to the second legs, first legs, and max. palpi, the face and maxilla separate from the antennæ and legs, retaining the eye-covers and adhering by the maxillary extremities to the rest of the case.

Chrysocorys.—I obtained larvæ, and bred them thirty or more years ago, and was under the impression that they could be had anywhere or at any time. It disappointed me a good deal not to be able to get them during several recent years that I have desired to study them afresh. I was, therefore, very pleased last March to capture a female moth, which very obligingly laid a number of eggs. These were laid singly, on either side, on the margins, or petioles, of the young leaves of the bramble-shoots, with which I had placed the moth for this purpose.

The egg is urceolate in shape, about 0·5 mm. high and 0·26 broad, rather narrower upwards, and having a hemispherical or flattened base, very much according to the situation in which it is laid, the rounded being the primary form; but when laid the egg is soft enough to take something of the form of the surface it is laid on, and sometimes has a regular flat base of the whole width of the egg. The upper end is flat, with a well-defined margin, from which arises a structure quite new to me in lepidopterous eggs. There is often, in lepidopterous eggs, a rim or ridge, or break in the smoothness of the surface at this point. The egg of *Choreutes* is, perhaps, as good an example of this as any. In *Chrysocorys* this rim carries fourteen transparent spines with bifid tips,

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forming a crown-like circle, and reminding one, in some degree, of the similar processes in the ova of some *Hemiptera*. The flat surface within these is marked by radiating impressions, proceeding from a small central micropylar rosette. The outer surface of the egg is covered with rather deep, irregular depressions, separated by rounded ridges, which, though irregular, have a distinct tendency to be hexagonal, with the longer axes of the spaces parallel with that of the egg. To escape, the young larva eats out the flat top within the coronet, and leaves the egg apparently little damaged. The newly-hatched larva is a white or colourless little atom. It is possible, however, to observe that the posterior dorsal tubercle carries a long smooth hair, directed rather backwards, the tubercle being raised round the base of the hair into a high conical projection, and the hair itself being longer than the diameter of the larva; the anterior trapezoidal is a much smaller hair, rising in a smaller tubercle, situated in the front base of the cone of the posterior; the supraspiracular is an equally small hair in a moderately-developed tubercle; the subspiracular tubercles are a reproduction of the trapezoidal, a large posterior hair on a high cone, and a smaller one in front, one directed backwards and the other forwards. I have not clearly defined the prolegs; the anterior and posterior hairs are much longer.

As the larva grows, the subspiracular hairs retain their simple character, but assume the appearance of the tines of a pitchfork on a common raised protuberance; the dorsal hairs, however, acquire a very special character. They continue to be a larger posterior sloping backwards, and a shorter anterior lying forwards, their bases are almost conjoined, and rise into a distinct peduncle. The hairs terminate in a sharp point, but on the upper aspect, near the apex, have a lancet-shaped transparent flange; and through the peduncle and down the hair is what looks like an inner tube, arising from the internal tissues of the larva, and terminating between the flange and apex of the hair. There is sometimes fluid at apex of hair provided through this tube. The surface of the hairs is finely waved or granulated. The spiracles are at the apex of a large brown chitinous mammilla. The ventral prolegs have a short conical pedicel, a rounded boss at apex, carrying six hooks regularly disposed around

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it. The anal prolegs have nine hooks disposed in a curved line that is less than a semicircle, the hooks are larger and stronger than the ventral ones. The true legs appear to have four joints before the claw, which is accompanied by a transparent, battledore palpus; the antenna is three-jointed, the second joint carrying a long hair and a fleshy tubercle, the third carries two terminal bodies.

These larvæ were full-grown by the middle of May; they lived on the upper side of the bramble leaf, spinning no silk except a very slight web. When about to moult, and when travelling from leaf to leaf, they are very sluggish in their movements, yet fond of moving occasionally to a fresh leaf; when at rest the head is rather hidden by being withdrawn into the second segment. They are of a glassy transparency, and match the colour of the bramble leaf very closely, so as to be difficult to see. In moulting, the slit appears to be dorsal, and the empty skin remains stretched out at length, with the head bent under the first segment. The cast skin makes a good preparation of the hairs.

The cocoon is a very remarkable structure, and I regret not having seen how it was made. It is attached by one margin, naturally probably to the bramble stem near the root, and consists of a network of stiff gum-like strands of silk, one set of these being in continuous lines, like the mortar between consecutive courses of brickwork, the other uniting these alternately like the vertical lines of mortar between the bricks in each course, the bricks being represented by the openings, which are, however, square rather than oblong; the primary strands are sometimes, as it were, in one set, from the four sets in which they appear to be constructed being accurately worked together; in other cases the four sets are more or less distinct, they would be separated by slicing the cocoon longitudinally and transversely down on to its attached margin. When each side is accurately constructed the courses arch upwards from either end of the line of attachment meeting in the line of transverse division suggested. There is a valvular longitudinal opening at either end, through one of which the larval skin is ejected, through the other the pupa emerges for the exclusion of the moth.

The pupa lies free in this cocoon with little spare

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space longitudinally, though rather free latitudinally. I ought to say that flimsy as the cocoon looks, it is really very hard, firm, and elastic.

The pupa is green with sundry markings, and these appear to increase with the age of the pupa, till it becomes very dark. I fear I ill-treated my pupæ, as only one emerged, and the rest have, I think, died and dried up. I imagined they would all come out very soon, with a view to a second brood; I now think that this is the rare exception, and that the pupæ lie over the remainder of the summer, and possibly the winter, though it is perhaps more likely that the insect hibernates as a moth.

The pupa has a rather prominent globular head, a distinct waist (dorsally), the abdominal segments gradually tapering and arching forward. The free segments are 4, 5, 6, ♀, and 4, 5, 6, 7, ♂, the wing and leg-covers extending over the fourth and part of the fifth segments.

The abdominal spiracles are each in a lofty brown cone, very similar to that of the larva, and on either side, somewhat dorsally, is on 4, 5, 6, 7, 8, 9, and less markedly on 3, a hook or spine, dark in colour, curved backwards, and ending in a sharp point—behind and outside these is a fine hair with recurved curled tips, and a similar hair is placed above and another below the spiracle; about ten similar and longer hairs form the anal armature. The spiracles have an unusually dorsal position, and there is a long interval between the subspiracular hair and two ventral ones. Six similar smaller hairs are on the face and head, and the mesothorax possesses two pairs. There is a minute point which appears to be the maxillary palpus, and is carried in dehiscence at the extremity of the first leg-piece. The maxillæ are separated to show the labial palpi broadly, and a portion of femur shows between the maxilla and first leg. The antennæ and second legs extend to end of wing cases, the tips of third legs beyond, the maxilla falls a little short, and the first legs reach little more than half way. The first legs touch the antennæ and exclude the second from the head. The prothorax is reduced to a very narrow strip and the dorsal head-piece is very large.

The formula of abdominal free segments is the same as that of a very large number of the Incompletæ, Tortrices, Psychids, Sesiids, true Tineids, Cossids, etc., so that this does not go far in showing an alliance with

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Pterophori whose formula is the same. More important as showing a separation is the fact that it preserves the habit of emerging from its cocoon before the exclusion of the moth; *Pterophorus* being fixed by a cremaster and usually making no cocoon. The great development of the dorsal head-piece is another very distinctive character; the dehiscence also is very different.

The cocoon of the American *Penthetria parvula* is extremely similar, but more regular and elaborate. Its pupa retains a very simple tineoid character, so that there is no doubt a considerable gap between these two forms, but there can be little doubt that the cocoon structure has a common ancestry and is not an independent invention.

Pterophorus.—The ovum is of oval section in every direction, a form that may most easily be described as that of an ordinary bird's egg, if laid on its side and then flattened. The different species I have examined vary in their size and in the proportion of their different diameters, but all have this general form: they are smooth, bright, and polished, and have faint markings of a network tending to a hexagonal mesh.

In some cases the narrowing towards the small end is not so evident, and in others (*bipunctidactylus*) the egg might almost be called cylindrical, so that there is considerable variation within definite limits which may, of course, be exceeded in species whose eggs I have not seen, but I have seen no suggestion of such a form as occurs in *Chrysocorys*.

The larva of most of our *Pterophori* are well known, and I don't know of one whose characters are at all like those of *Chrysocorys*—either as to the retention in all stages of the same arrangement of hairs and tubercles, or in having at any stage precisely the same arrangement as in *Chrysocorys*.

The pupa of *Pterophorus* is highly specialised, yet retains several of the most definite characters of the *Incompletæ*. Only the three first abdominal segments are fixed, the next three (and four in ♂) are free, the antennæ and maxillæ adhere to the head-piece and separate from the other parts on dehiscence, the eye-covers going with the dorsal head-piece. It possesses a very special and elaborate set of terminal hooks, by which it fixes itself to a pad of silk, these are supple-

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mented by a separate little group on the ventral surface of the ninth abdominal segment. The surface of the pupa may be very simple and smooth, and its texture delicate as in *Tinea*. It may be covered with a most confusing panoply of hairs as in *A. spilodactyla*, or have various elaborate hooks and processes as in *A. acanthodactyla*. In this case one is reminded, in some degree, of the hooks of *C. festaliella*, but in *A. acanthodactyla*, these hooks are recurved, in *C. festaliella* they are directed simply backwards. Apart from its thorough-going retention of micro characters, it is separated not only from *Orneodes*, but from *Chrysocorys* also, by the extreme reduction of the dorsal head-piece. So reduced is this, that its presence would be doubted in some species, but that it carries with it the eye-covers as in typical micro dehiscence.

As a summary of the facts and deductions herewith presented, I may recapitulate:—

A correction as to free segments of *Limacodidæ*.

A correction as to *Nolidæ* not being "macros."

A suggestion that sundry families of Palæolepidoptera may be postulated as having once existed.

That *a series* (from below upwards) of families originated in *Micropteryx*, or at any rate in Adelids, characterised by a very narrow prothoracic, and a very large head-plate in the pupa.

That *Epermenia* and *Orneodes* are typical members of this series, and probably also *Chrysocorys*.

That *Pterophorus* is not a member of this series, or, if it is, originated very early in it, and reached its present position by an undiscovered route.

That Coleophora belongs to this series, and was derived from Adelids by a separate route from *Tinea*, *Epermenia*, etc.

That the Pyraloids (including most *Tineina* with Obtect pupæ) form a higher part of this series.

Whether these proceed onward to Pyrales (and Geometers) is not fully discussed, and left doubtful.

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Explanation of Plates VI. and VII.

PLATE VI.

Fig. 1. Ovum of *Orneodes hexadactyla* × 40 diam., amongst glands of honeysuckles.

2. Ovum of *Epermenia chærophylellus* amongst hairs of *Heracleum*.

2*a*. The same, isolated.

3. Ovum of *Chrysocorys festaliella* × 50 diam.

3*a*. Another view of summit of egg.

3*b*. One of the spines of coronet.

4. Ovum of *Pterophorus* (*Mimæseoptilus*) *phæodactylus*.

The network of cells is obscure and not at all a raised pattern as the figure rather suggests.

5. Pupa of *Chrysocorys festaliella*, ventral aspect.

6. Lateral view of segments 4 and 5 abdominal (8 and 9), showing hairs and the very dorsal position of the raised spiracles.

7. Anal armature of *Chrysocorys* pupa, lateral view.

8. Diagram of dehiscence of *Chrysocorys festaliella*. Shows the large head-piece attached to eye-piece (which adheres to first leg in specimen sketched) and the narrow prothoracic piece, antennæ attached to head, micro dehiscence.

9. Diagram of dehiscence of *Pterophorus*, showing very narrow head-piece, attached to eye-piece, large prothoracic piece, antennæ attached to head as in most typical "micro" dehiscence. 1, 2, 3 refer to segments, *e* = eye; *a*, = antenna; *l*, = leg; *m*, = maxilla.

10. Ventral view of pupa of *Pterophorus* (*Aciptilia*) *spilodactylus*. The hairs are rather too diagrammatic.

11. Lateral view of female pupa.

12. „ „ male pupa.

13. One segment of pupa. This is not as accurate as is desirable, but serves to show the very different structure to the other pupæ figured.

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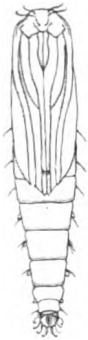
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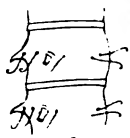
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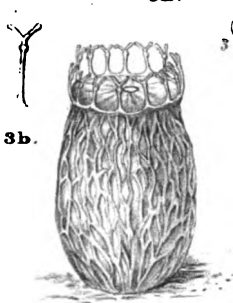
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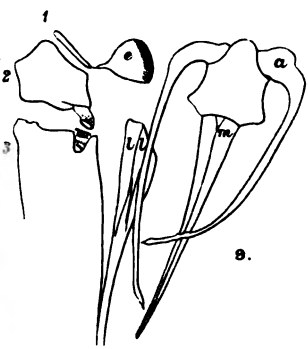
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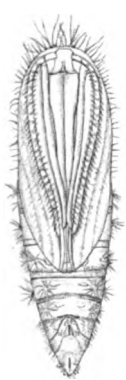
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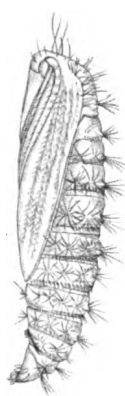
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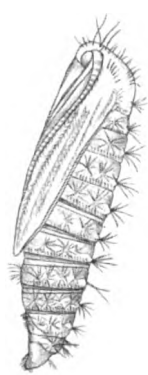
12.

Edwin Wilson del
H.J. Pocock.

Mintern Bros. Lith.

Eggs of Orneodes, Epermenia
& pupæ also of Chrysochorys & Pterophorus.

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PLATE VII.

FIG. 1. Pupa of *Epermenia chœrophylellus*, ventral aspect, shows minute maxillary palpus.

2. „ „ „ „ lateral aspect.

3. „ „ „ „ dorsal aspect

These show the neck-like character of the prothorax, which is also seen in

4. Enlarged view of front, seen laterally, a little too diagrammatic.

5. Lateral view of anal armature.

6. Diagram of dehiscence of *Epermenia*, antennæ separate from head, and remain attached to legs and wings, narrow prothorax, minute maxillary palpi, eye-piece remains with face-piece, macro dehiscence.

7. Pupa of *Orneodes hexadactyla*, ventral aspect, very similar to *Epermenia*, except in loss of maxillary palpi and in anal armature. The loss of mobility in segment 7, abdominal in ♂, cannot be shown in these figures.

8. „ „ „ „ lateral view.

9. „ „ „ „ dorsal view.

10. Diagram of dehiscence of *Orneodes*, showing immense size of head-piece, which is free from eye-piece, the latter remaining attached to face-piece. Antennæ free from head, and attached to legs and wings; very narrow prothorax, macro dehiscence.

11. Cocoon of *Chrysocorys festaliella*.

12. Portion of network of same.

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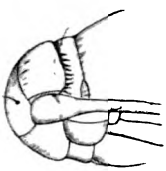

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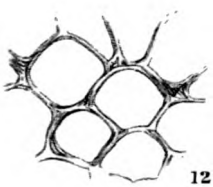

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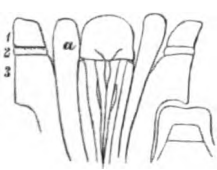

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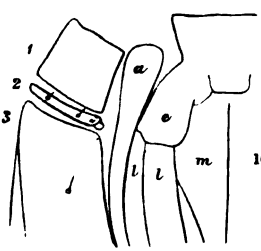

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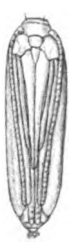

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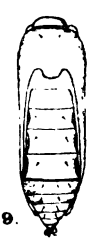

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Edwin Wilson, H.J. Peacock. } del.

Pupæ of Epermenia & Orneodes.

Mintern Bros. lith.

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VII. *Descriptions of new genera and species of Coleoptera from South Africa, chiefly from Zambezia.* By Louis Péringuey, F.E.S.

[Read March 4th, 1896.]

Family PAUSSIDÆ.

Gen. Paussus, Linn.

P. arduus, n. sp.

Red, shining; head with a long conical tubercle on the vertex, anterior part dehiscent, hairless and slightly punctured in the posterior part; club of antennæ short, thick, convex on both sides, broader than the head, carinate all round, depressed at the base, with the outer angle produced in a long, sharp, slightly recurving spine, upper posterior margin without any longitudinal impressions; prothorax smooth, longer than broad, with a deep transverse impression reaching from side to side and having a yellow pubescent patch at each end, the anterior and posterior part of the disk equally broad, the anterior a little more raised than the posterior, the sides nearly parallel; elytra elongate, sub-parallel, smooth and very closely punctured, the punctures in the anterior part being deeper and broader than those behind; pygidium very closely and deeply punctured; femora not clavate; tibiæ slender, not dilated at the tip. Length 8, width 2½ mm.

Belongs to the same group as *P. spinicoxis*, *P. thomsoni*, etc. The shape of the club is nearly the same as in the last mentioned species, but much more convex on each side; the prothorax resembles that of *P. spinicoxis*, but is less attenuate laterally in the anterior part.

Hab. Zambezia (Manica).

P. manicanus, n. sp.

Reddish-brown, shining; head much depressed, nearly smooth and hairless; club of antennæ twice as long as the head and neck, nearly oblong, a little narrower at the apex and base than in the middle, compressed but thicker in the median part, bluntly carinate all round and with the posterior angle produced in a sharp moderately recurved spine; prothorax nearly cordiform, but

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very deeply sinuate laterally in the middle, and with an arcuate transverse median narrow and shallow impression; the anterior part of the disk is hardly more raised than the posterior, and slightly aculeate in the posterior angle above the constriction, when there is also a very small, pubescent, yellow tuft; elytra parallel, deeply and closely punctured, each puncture bearing a short seta; pygidium punctulate and setulose; femora a little swollen, tibiæ slender. Length 9, width 2½ mm.

Hab. Zambezia (Salisbury).

The nearest ally of *P. manicanus* is *P. planicollis*, Raffr., from Abyssinia. The shape of the prothorax is identical; the head is equally depressed, but has no trace of a minute conical tubercle at the extreme apex; the antennal club is of a shape similar to that of the ♂ of *P. planicollis*, but not so long, and therefore a little broader in proportion.

P. raffrayi, n. sp.

Piceous-black, with the apical part of the elytra and the tarsi reddish-brown; head rugulose, with the anterior part deeply impressed in the centre and the walls of the impression raised in two short tuberculiform processes, posterior part bi-impressed; club of the antennæ sub-ensiform, very long, compressed, external margin with a moderately wide groove reaching from the base to near the apex, both margins of the groove very faintly notched; prothorax bi-partite, the anterior part raised, smooth, the median transverse cavity wide and deep, and having two pubescent yellow patches in the centre, posterior part depressed and with three tuberculated indentations; elytra elongate, sub-parallel, shining, moderately punctured, each puncture with a very short greyish hair; femora not thickened; anterior and intermediate tibiæ slender, posterior tibiæ broadly dilated and flat. Length 5, width 1½ mm.

Hab. Natal (Frere).

The shape of the club of the antennæ is not unlike that of *P. germari*; it is however longer, more curved outwardly, and not attenuate at the tip.

P. concinnus, n. sp.

Head, prothorax and legs brick-red; elytra black, edged with red at the base and apex; head and prothorax glabrous, the former edged in front on the vertex with a high semicircular ridge, which

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is broadly emarginate in the middle and reaches from eye to eye, posterior part raised above the neck into a ridge higher than the anterior one, and with a median and two lateral sinuations; median part of the head plane, and with a broad depression above each eye partly edged by a very narrow groove which extends also along the posterior raised part; club of the antennæ long, broad, compressed, as long as the base of the prothorax, slightly curving in the inner edge, which is distinctly marginate and has besides a distinct raised line running parallel to it, outer margin broadly grooved from base to apex, and having seven round alveolæ as well as six obtuse serrations on the upper edge, the intervals of which bear each a very short yellowish seta, outer basal angle of the club long and sharp; prothorax bi-partite, the anterior part much raised, short, abruptly truncate, deeply incised in the centre and on each side, and with a deep transverse impression; the posterior part is narrower than the anterior, and has the shape of a truncate cone, broadly scooped out, in the anterior median part, with each side of the incision produced in a sharp, short tubercle; elytra closely set with very short greyish hairs, but very indistinctly punctured; femora not clavate, tibiæ straight, not thickened. Length 6, width 2½ mm.

Hab. Zambezia (Salisbury).

The shape of the antennal club is that of *Pleuropterus alternans* in general outline, the impressions on the upper side imitating somewhat the articulations of the antennæ; the scooped out space of the posterior margin is not unlike that of *P. klugi*, but the serration of the edges of the margin, as well as the impressions on the upper part, are very different.

P. viator., n. sp.

Piceous-black, with the antennæ and legs very dark red; head rugulose and having on the middle of the vertex three short impressions, the median one of which is the deepest and is bounded by two short ridges; penultimate joint of antennæ thick, the club short, massive, the inner margin sharp, a little sinuate at the tip, the outer one very broadly and deeply scooped out, with the basal angle moderately long and sharp, the cavity of the outer margin containing six distinct alveolæ and the two edges slightly serrulate; prothorax bi-partite, with the anterior part very narrow and in the shape of a ridge with a median groove, the median excavation very deep, and the lateral part not deeply excised, and with a short blunt tubercle on each side and two tubercles in the middle; elytra short,

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sub-parallel, smooth; femora and tibiæ thick, flattened, posterior tibiæ very broadly dilated. Length 5, width 2 mm.

Hab. Natal (Frere).

Belongs to the group of *P. ruber*, *P. cucullatus*, etc. The club of the antennæ is not so broadly scooped out in the outer margin as in *P. cucullatus*, nor is it so much curved outwardly; the upper part is not impressed between the inner and posterior margins, and the former is nearly straight, not curved, nor is the space between the two margins as broad as in either of the above-named species.

P. barkeri, n. sp.

Reddish-brown, with very short pubescence all over; head with two median carinæ aculeate in front and overlapping the point of insertion of antennæ, these two ridges slightly diverging from the middle of the vertex and having a narrow groove between, ceasing abruptly above the neck, which is very short and not constricted; penultimate joint of antennæ quadrate, very thick, club moderately long, not compressed, deeply sinuate in the inner part which, like the rounded apical part, is acutely marginate, outer part also sinuate and having on the margin four very distinct teeth bearing several very short setæ, while the apical angle is developed into a long, broad, blunt spur, the inner part of which curves so as to form a short tooth corresponding to a similar tooth situated on the opposite part of the base of the club; the joints of the antennæ are covered with closely set, very short, squamiform hairs; prothorax bi-partite, the anterior part in the shape of a ridge slightly grooved in the centre, posterior part as broad as the anterior, with a broad median depression nearly reaching the base, two pubescent patches on the transverse impression; elytra sub-parallel, covered with very short, closely set hairs, apparently thicker than those on the prothorax, and without punctures; pygidium thickly pubescent and with a fringe of long, thickly set, yellowish hairs; anterior and intermediate femora and tibiæ slender, posterior femora and tibiæ dilated and compressed. Length 9, width 3½ mm.

Hab. Natal (Durban).

No known ally; the nearest approach to the shape of the antennal club is in *P. bicolor*, Raffr., from the Andaman Islands, but the incised portion at the inner part of the base is absent in that species.

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P. marshalli, n. sp.

Reddish-brown, shining, elytra thickly pubescent; vertex of the head nearly plane, posterior part ridged above the neck, and along the outer sides; penultimate joint of antennæ quadrate, nearly as large as the head, club broad, massive, inner margin carinate, with a short, round basal spur not projecting much, outer margin broadly hollowed with the edges bi-sinuate, acute at the apical part of the hollow, and bearing on each side a dense tuft of long, yellowish hairs, basal outer spur very broad and sub-quadrate; prothorax bi-partite, the anterior part compressed in a sharp ridge, slightly emarginate in the centre and sub-aculeate laterally, the posterior part hollowed anteriorly, and with a triangular longitudinal groove, and the outer sides produced in a carina sinuate in the middle, sharp in the anterior part, and with the posterior part forming a long tooth standing at an angle with the base, both the points of the lateral carina having a distinct tuft of hairs; elytra short, sub-parallel; pygidium with short pubescence and having in the middle three transverse rows of long and very thick bristles; legs slender, anterior femora not thickened. Length 5½, width 2½ mm.

Hab. Natal (Frere).

This species belongs to the group of *P. laticollis*, *P. penicillatus*, and *P. rugosus*, Raffr., from Abyssinia, and are distinguished by having thick stiff bristles on the pygidium, as well as tufts of hairs on the apical part of the edges of the hollowed outer margins of the antennæ. The nearest ally of *P. marshalli* is *P. penicillatus*, but in the antennal club of the former there is no longitudinal impression whatever on the upper part along the inner margin, nor is the scooped-out space distinctly impressed, and the inner edge of the hollow is very deeply sinuate.

Family SCARABÆIDÆ.

COPRIDES.

Gen. Heliocopris, Hope.

H. selousi, n. sp.

Black, moderately shining; head plicate transversely; prothorax very rugose, sub-opaque; elytra with four small tubercles at the base of the intervals. In the ♂ the head bears a short, compressed horn, truncate at the tip or slightly sinuate, placed in the posterior part of the clypeus; median part of the head with a small ridge

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reaching from the anterior horn to the base; prothorax truncate in front, with a very deep, but not broad, lateral excavation, the anterior part carinate, strongly sinuate laterally above the excavation, and with the median part produced into a horizontal, very long, compressed process with a perpendicular conspicuous tooth underneath; this horizontal process extends as far as the clypeal horn, which it overhangs. In the ♀ the head has a short, transverse occipital carina, the prothorax is not so much raised, is deeply sinuate in front, depressed, but not excavated, and the median part is produced into a projecting carina, overhanging a little the apex, and so deeply emarginate in the middle as to be almost bifid. Length 32–37, width 20–21 mm.

Hab. Zambezia (Manica, Mazoe).

Its nearest ally is *H. neptunus*, Bohem. The sculpture of the head and prothorax is alike, the tubercles at the base of the elytra are also similar, but the horn of the clypeus is very much shorter, and the elongated horizontal process of the prothorax is very different.

Gen. Onitis, Fabr.

O. zambezianus, n. sp.

Reddish-brown, with the elytra opaque; head finely plicate transversely on the clypeus, granulate behind, clypeus elongate in the anterior part, more so in the ♀ than in the ♂, without any clypeal carina, but with the frontal one sharp and very much raised, vertex almost bi-impressed, posterior edge very distinctly raised; prothorax moderately convex, broad, carinate in the anterior and lateral parts, closely punctured from the base to about three-fourths of the length, posterior part nearly impunctate; elytra elongate, convex along the sutural part towards the middle, very finely striate, with the intervals plane and smooth; underside piceous-brown, metasternum closely punctured and densely hairy, abdomen nearly smooth, but with a few lateral setigerous punctures; anterior femora of the ♂ thick, grooved underneath, and with an acute ridge, bearing a sharp tooth in the middle of the groove and a smaller apical one in the anterior part of the apex; tibiæ long, straight, moderately thick, multi-denticulate inwardly, having a double ridge on the upper part, strongly quadri-dentate externally, and with the inner apical tooth very long and incurved; intermediate femora deeply incised at the apex, carrying a sharp median posterior carina, developing into a sharp tooth, apical part

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also toothed, but with the tooth smaller than the one of the carina, tibiæ narrow at the base and almost suddenly enlarged in an elongate quadrate laminated process inwardly; posterior femora with a small, serrate carina, tibiæ slightly incurved, not dilated inwardly. Length 24–26, width 14 mm.

Hab. Zambezia (Manica).

Belongs to the group of *O. curvipes*, Lansb.; the clypeus is less aculeate in the male, and the general facies is a little less convex. As in *O. curvipes* the intermediate tibiæ of the ♂ have an inner lamina, but differently shaped, and the disposition of the teeth on the anterior and posterior femora is very different.

O. dispar, n. sp.

Dark metallic-green, moderately shining, but more opaque on the elytra; head with the clypeus rounded in the ♂, a little more aculeate in the ♀, finely plicate in front, rugose behind, with a short clypeal ridge and a frontal one moderately raised, vertex a little hollowed, and with the posterior part carinate and the median part much raised in both sexes; prothorax moderately convex, closely punctured from apex to base; elytra elongate, hardly convex, feebly striate, with the intervals faintly punctured; metasternum and femora closely punctured. In the ♂ the anterior femora are thick, with a very small median carina, and are without teeth, the tibiæ are straight, carinate in the middle, faintly serrate inwardly, quadri-dentate outwardly, with the inner tooth short and with a long fascicle of hairs underneath, intermediate and posterior femora with an acute posterior lamina, but neither dentate nor serrate, intermediate tibiæ normal, posterior ones compressed and with a long terminal spur on each side, the inner one spiniform, the other one thicker, but both curving slightly inward. Length 24, width 13–14 mm.

Hab. Zambezia.

Allied to *O. robustus*, Boh., and *O. orthoptus*, Lansb., but differentiated from both by the shape of the terminal part of the hind tibiæ.

Gen. Onthophagus, Latreille.

O. mashunus, n. sp.

Black, with a slight bronze sheen, more distinct on the prothorax; antennæ flavescent; clypeus a little elongate in the median part; head with a transverse median carina; head and

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prothorax covered with densely set granules, the prothorax broad, as long as the elytra, with very short pubescence and with the outer margins serrulate; elytra finely striate, with the intervals broad and finely granulate; underside black. In the ♂ the vertex of the head is armed with two long incurved horns, compressed and truncate at the tip, and the basal space between the horns is developed in a compressed spine, much shorter than the horns, and incised at the tip, and the prothorax has a deep median excavation in the centre, surmounted at the apex by a thick compressed rugose spine, incised at tip, rugose and directed forward; in the ♀ the hind margin of the head is produced in a trituberculate ridge, the anterior part of the prothorax is more declivous, with no excavation, and the anterior part is surmounted by a narrow, but high ridge, deeply sinuate in the middle. Length 12-14, width 7-9 mm.

Hab. Zambezia (Salisbury).

This species is allied to *O. pyramidalis*, Klug; in shape the cephalic horns of the ♂ are much thinner, more compressed, and spread more outwardly, somewhat in the manner of those of *O. rangifer*, Klug, but the median compressed spine is absent in *O. pyramidalis*, the thoracic spine is less compressed, and shorter than in the last-named species, and ends differently.

O. ponderosus, n. sp.

Bronze-black, a little lighter in colour on the prothorax; palpi and antennæ yellow; clypeus a little elongate in the middle, closely plicate transversely, and having in the middle a transverse raised line, while the hind margin is produced in a high transverse ridge, sinuate in the ♂ in such a way as to give it the appearance of bearing five short blunt tubercles; prothorax broad, very deeply sinuate laterally behind, covered with short granules in front, and punctures behind, abruptly truncate in front and with a moderately deep median excavation, the anterior part produced in a transverse ridge, reaching almost from side to side, the median part of which is more raised and slightly sinuate; elytra striate, intervals very finely shagreened and very closely, although not deeply punctured; underside piceous. The ♀ differs from the ♂ in having the occipital ridge, as well as the thoracic lamina, less raised, and the anterior part of the prothorax hardly excavate. Length 19-23, width 11-14 mm.

Hab. Zambezia (Salisbury, Manica).

In general facies as robust as *O. giganteus*, Har., from Madagascar.

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O. insignis, n. sp.

Head and prothorax bright metallic-green, palpi, antennæ, and tarsi flavescent, elytra reddish-yellow, underside dark grey, legs black; clypeus a little elongated in front; head broadly and closely punctured, with a median transverse raised line in both sexes, ♂ with a very long horn, straight for three-fourths of the length, and slightly curved backward towards the tip, ♀ with a straight transverse carina; prothorax very closely and deeply punctured, glabrous—in the ♂ deeply excavated in the median part from the apex to a little short of the base, dehiscent in the anterior part, and with the sides of the excavation raised in the median part in two broad triangular and conspicuous tubercles—in the ♀ there is no median longitudinal excavation, the anterior part is a little more declivous, and in the anterior part there is a transverse ridge not broader than the occipital one; elytra finely striate, with the intervals glabrous and closely, although not deeply punctured. Length 9, width 5 mm.

Hab. Zambezia (Salisbury).

O. gemmeus, n. sp.

Head and prothorax bright metallic-green, with short pubescence; elytra flavous, with the suture black, and a broad band of the same colour, extending from near the humeral angle to the suture, which it joins at a short distance from the apex; head broadly and closely punctured, with a distinct transverse ridge, and behind it, a highly raised slightly shorter lamina; prothorax very finely granulated in the anterior part, closely punctured behind, declivous anteriorly, bi-tuberculate above the declivity, the tubercles blunt and slightly diverging, impressed longitudinally from the median part to the base, the impression with a narrow median groove; elytra striate, intervals deeply and closely punctured, each puncture bearing a short hair, thus making the intervals thickly pubescent; pygidium very hairy; underside and legs piceous-black. Male unknown. Length 7, width 4 mm.

Hab. Zambezia (Salisbury).

ORPHNIDES.

Gen. ORPHNUS, Macl.

O. zambezianus, n. sp.

Brick-red, shining, head and clypeus infuscate; head punctulate anterior margin of the clypeus bearing a long sharp horn, slightly

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directed backwards; prothorax punctulate—in the ♂ broadly and deeply excavated from the apex to the base, with the walls of the excavation retuse, and produced in the anterior part in a conical tubercle on each side a little higher than the clypeal horn, posterior part of the excavation semi-circular—in the ♀ with a faint median impression in the anterior part; elytra convex, grooved along the suture and the outer margins, but without any trace of dorsal striæ, closely punctured, the punctures almost superficial. Length 10-10½, width 6-6½ mm.

Hab. Zambezia (between Limpopo and Zambeze Rivers).

A little larger and more massive than *O. meleagris*, with the clypeal horn much longer, the prothorax more broadly and deeply excavated, and the anterior part of the wall produced in a longer and sharper tubercle.

O. mashunus, n. sp.

Piceous-black, shining; head and clypeus smooth, ♂ with a short, sharp horn in the centre of the head; prothorax closely punctured laterally, smooth along the base, excavated in the anterior part, the excavation sub-elongate, quadrate, shallow, with the anterior edge only slightly raised, and hardly aculeate past the median part, between the posterior part of the excavation and the base there is also a shallow median impression; elytra moderately convex, and on a plane with the ridges of the prothoracic excavation, grooved along the suture and the outer margins, striate from the suture to the median part of each wing-cover, punctured, the punctures shallow but well-defined; underside piceous-red. Length 10, width 6 mm.

Distinct from both *O. zambezianus* and *O. meleagris* in having the cephalic horn in the middle of the head; the shape of the prothoracic excavation is also different, and the elytra are striate in the median part.

Hab. Zambezia (Salisbury).

O. ovampoanus, n. sp.

Piceous-black, shining, head with a short sharp horn; prothorax punctulate in the ♂, excavated in the anterior part, the excavation shallow and with a deeper median impression, the ridges of the excavation hardly raised, and straight to the median part, the posterior part of the excavation, which reaches only the median part of the disk, rounded; in the ♀ the prothorax is only slightly

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impressed in the middle of the anterior part; elytra convex, punctured, grooved along the suture and the outer margins. Length 7, width 4 mm.

Hab. Ovampo Land (Omramba).

Smaller than *O. mashunus*, with the cephalic horn almost similar; the excavation of the prothorax is shallower, does not extend so far back, and the ridges are still less raised.

O. pugnax, n. sp.

Brick-red, or at times piceous-brown; head of the ♂ with a long central, sharp, conical horn; prothorax very deeply excavated from base to apex, with the lateral walls of the excavation produced in two sharp points, an anterior and a median one, the latter a little more raised than the anterior, but less acute; in the ♀ the prothorax is a little raised circularly above the apical margin, and has a small longitudinal impression in the middle; elytra convex, faintly striate in the anterior part, but not laterally, and set with rough, confluent punctures almost alveolate on the disk. Length 5–5½, width 3–3½ mm.

Hab. Zambezia (Salisbury).

A little smaller and proportionally less massive than *O. rufulus*, Boh., and at once distinguished from it by the shape of the prothorax, which in the latter is also deeply excavated, but with the walls produced in one long conical tubercle on each side, while there are two in *O. pugnax*; the punctuation of the elytra is also much deeper and rougher than in *O. rufulus*.

GEOTRUPIDES.

Gen. Bolboceras, Kirby.

B. panza, n. sp.

Brick- or ferruginous-red, shining; clypeus short, deeply emarginate; head very closely and deeply punctured, with a short, transverse sub-apical carina in both sexes; prothorax dehiscent in the ♂ from apex to base, deeply sinuate in the anterior margin on each side, the apical margin raised in a carina, and having along the basal part five sharp, conspicuous tubercles, the two outer ones of which are sometimes produced in a long incurved process, while the three median ones are shorter and near one another (in those specimens in which the lateral tubercle is

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greatly elongated, the one near to the median is nearly obliterated); the declivous part closely punctured for about two-thirds of the length, and there is a broad, although little raised, lateral callus; in the ♀ the anterior part alone of the prothorax is declivous, and in the median part there is a transverse carina, slightly sinuate in the centre, and the punctures are much deeper than in the ♂ and nearly confluent; elytra very convex, finely striate, striæ punctulate; underside very hairy; anterior tibiæ with five teeth. Length 23–24, width 16–16½ mm.

Hab. Natal (Durban); Zambezia (Victoria Falls).

Fairmaire has described in the "Annales de la Société Entomologique de Belgique," vol. xxxviii., 1894, p. 652, a large species from the Congo (French Territory), which, judging from the description, seems to be somewhat allied to *B. panza*, and which, he justly remarks, is not unlike some Australian species; he adds, however, that the African species are small and without "armature," by which expression he means, I presume, prothoracic horns. I have retained for this species the name (*in litteris*, Dohrn) it bore in Lansberg's collection, now the property of Mons. R. Oberthür.

MELOLONTHIDES.

Gen. Rhabdopholis, Burm.

R. irrorata, n. sp.

Head, prothorax, and underside piceous-black, elytra and legs chestnut-brown; clypeus narrow, recurved, punctured like the head, with white squamæ in the punctures; head with a blunt median longitudinal ridge and an elongated impression on each side, followed by a smooth space, squamæ not dense; prothorax broader than long, a little attenuate laterally from the outer angle to near the median part, nearly straight behind, closely punctured and squamose, with the anterior and lateral margins fringed with very long hairs, the central part of the disk with two broad, but shallow, longitudinal punctured grooves separated by three smooth intervals, and a supra-lateral one also edged with a smooth interval on either side, the scales on the outer margin thicker than on the disk; elytra oblong-ovate, costate, with the intervals broad, and having a duplicate series of punctures, each of which bears one, or more, whitish scales, outer margin more densely scaly than the other intervals; underside densely hairy, the hairs of the metasternum very long, abdomen densely squamose. Length 15, width 7½ mm.

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Hab. Transvaal (Leydenburg).

Smaller and less depressed in the posterior part than *R. albostriata*, Burm., and also less densely squamose; the head is also shorter in proportion, and the clypeus not at all emarginate, and the claws are not quite so much developed. Female unknown.

Gen. ANOMALA, Samouelle.

A. pĭnĝuis, n. sp.

Testaceous, with the head infuscate, the prothorax somewhat brick-red and the elytra black, with a long and broad humeral yellowish band; antennæ and palpi rufescent; intermediate and posterior tarsi infuscate; anterior and intermediate tibiæ infuscate laterally, posterior ones black; clypeus one-third shorter than the head, separated by a narrow transverse groove, and very closely and deeply punctured like the head, but more rugose; prothorax convex, a little attenuated laterally from the apical angle to the median part, straight from there to the basal angle, finely but not closely aciculate; elytra moderately elongate, slightly depressed laterally below the humeral angle, a little ampliated from the median to the posterior part, convex, retuse behind, and having on each side three smooth raised lines, intervals irregularly punctured but with a distinct series of punctures on each side of the raised lines; the scutellum is testaceous, and the yellowish, or sometimes testaceous, lateral band on the elytra extends from the outer margin to about the median part of the width of each wing-cover, for about one-third of the length, and is prolonged from there as a narrow discoidal band, extending as far as the median part, where it is somewhat aculeate; underside pale-yellow. Length 18–19, width 10 mm.

Hab. Zambezia (Salisbury).

RUTELIDES.

Gen. ADORETUS, Cast.

A. melanoleucus, n. sp.

Head and prothorax piceous-brown, with a faint greenish metallic tinge, outersides of the prothorax sub-rufescent; antennæ reddish-brown, with the club black; legs piceous, with the exception of the anterior ones, which are rufescent; clypeus distinctly margined, with the margin recurved, nearly as long as the head, and both covered with long, squamiform hairs; prothorax bi-sinuate in front and behind, lateral part also sinuate behind, and a little

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attenuate in front, very densely squamose; elytra twice as long as the prothorax, hardly broader at the base, a little ampliate behind, moderately convex, densely covered with white scales, and with two longitudinal dorsal series of five dark-green patches, separated from one another by a small patch of denser and whiter scales; in the lateral series the two anterior patches are coalescent, forming a band reaching from the shoulder to about the median part; underside and legs squamose. Length 9, width 4 mm.

Hab. Zambezia (Buluwayo).

A species very distinct from the other South African ones known to me; I am, however, acquainted with *A. tessulatus*, Burmeister.

CETONIDES.

Group *ISCHNOSTOMINI*.

Mazoe, n. gen.

Mentum as in *Ischnostoma*, palpi shorter; clypeus as long as the head, excavate, with the frontal and lateral margins recurved and sinuate in the interior part laterally, deeply constricted at the junction with the head; antennæ short, the club as long as the clypeus; prothorax much attenuated in front, where the apical part is only half the width of the base, depressed; scutellum very long, sharply triangular; elytra depressed, as broad as the prothorax at the base, sinuate laterally behind the shoulder and gradually narrowed behind; legs long, slender, claws very long, anterior tibiæ bi-dentate, posterior ones with a median spine.

Ischnostoma albonotata, Péring. (Trans. S. Afric. Philos. Society, 1885, p. 97), belongs to the present genus.

M. jucunda, n. sp.

Head and clypeus deeply and closely punctured, and with a few bristles, the median part of both with an orange-yellow covering; prothorax closely punctured, gradually ampliated laterally from the anterior angle to the base and sinuated above it, margined, depressed, deeply punctured, the whole of the disk covered with an orange-yellow tomentum, and having a small quadrate denuded patch in the middle of the apical part, one small lateral spot on each side and two sub-quadrate ones in the median part of the base above the scutellum, the lateral and posterior margins also being denuded; scutellum long, triangular, denuded; elytra as broad as

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the prothorax at the base, gradually attenuated from thence to the apex, which is about narrower by one-fourth, plane, striate, with the intervals convex, dull red, with a narrow supra-marginal greyish-white band extending from the shoulder to the suture, lateral and posterior margins denuded, as well as the humeral and apical calluses; pygidium elongated, black, with two white patches; underside black, punctulate; prosternum and legs slightly pilose. Length 14, width 7 mm.

Hab. Zambezia (Salisbury).

Gen. Cetonia, Fabr.

C. nigropunctulata, n. sp.

Brownish-red, with a slight fleshy tinge, the basal part of the head and the underside piceous-black; head and clypeus punctulate, lateral part of the head pubescent; prothorax gradually attenuate laterally from base to apex, dehiscent in the anterior part of the disk, punctulate, and having eleven distinct and regularly arranged black spots; elytra deeply sinuate below the humeral angle, nearly parallel from there towards the apex, tricostate on each side of the suture, as well as punctate-striate, and having on each side twelve black round spots; pygidium without any white patch; underside tomentose, last abdominal segment rufescent. Length 14, width 8 mm.

Hab. Transvaal (Leydenburg).

A little more massive and more convex than *C. carneola*, Burm., and redder; the black spots on the prothorax and elytra do not commingle in the least.

C. aspersa, n. sp.

Bronze, shining, covered with closely-set squamules; head closely punctured; prothorax attenuate in front from about the median part, with thick but short pubescence, closely punctured, but also with narrow, irregular longitudinal impressions filled with dense greyish-white squamules, median part with a smooth, longitudinal, raised line; elytra deeply sinuate laterally, bi-costate on each side, with short pubescence, rugose, with the rugosities filled with dense squamules; pygidium and underside densely squamose. Length 13, width 7 mm.

Hab. Zambezia (Mazoe).

Allied to *C.* (*Pseudoprotætia*) *amakosa*, Boh., but a little larger, and very densely covered with scales.

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Family BUPRESTIDÆ.

CHALCOPHOROIDES.

Gen. PSILOPTERA, Sol.

P. chalcophoroides, n. sp.

Bright metallic-grey, with a coppery sheen on the upper part, underside and legs glowing, coppery-red; head moderately rounded, irregularly foveate, eyes elongate, narrow; antennæ short, greenish; prothorax nearly twice as broad as long, rounded in the anterior part and also slightly attenuated near the base, depressed, with the outersides nearly flat, irregularly sub-foveate on the disk and sides, and with one small, smooth raised spot in the anterior lateral angle and another on each side of the median longitudinal impression, which is broad and shallow, the outersides not separated from the discoidal part by a longitudinal depression; elytra as broad as the prothorax at the base, with the humeral angle sloping, moderately sinuate laterally above the median part, as broad in the middle as at the base, gradually aculeate from there to the apex, which ends in a moderately sharp sutural spine, depressed on the upper part, broadly and deeply punctate-striate, with the intervals narrow but much raised, glabrous, but having a broad, supra-marginal, pubescent yellowish band reaching from base to apex. Length 24–25, width 9–9½ mm.

Hab. Zambezia (Salisbury).

P. æneola, n. sp.

Dull bronze, with the punctures brighter on both upper and lower parts; head with very short pubescence, broadly and irregularly punctured and with a narrow, transverse raised spot; prothorax sub-diagonal laterally in the anterior part, nearly straight from there to the base, moderately plane, with the outersides a little more depressed but not separated from the disk by a longitudinal impression, roughly punctured, with the sides very rugose, and with two small but very distinct, smooth tubercles on each side, one at the apical angle, the other in the middle of the anterior part of the disk; elytra sinuate laterally before the median part, which is as broad as the base, gradually aculeate from beyond the middle to the apex, which ends in an apical and a sutural spine on each side, depressed for some distance from the base, closely punctured, and with five very little raised, nearly smooth costæ, interrupted five or six times by an oblong patch of punctures, smaller and more closely set than those in the intervals; underside and legs pubes-

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scent, a little brighter than on the upper part, lateral part of abdominal segments with one irregular, elongated, somewhat indistinct, denuded patch. Length 23, width 9 mm.

Hab. Zambezia (Salisbury).

P. stataria, n. sp.

Bright bronze with the prothorax and underside brassy; head foveate, impressed in the anterior part, faintly grooved longitudinally on the vertex; prothorax very slightly attenuated laterally in the anterior part, nearly straight from thence to the base, but a little sinuated above it, moderately plane, with the disk separated from the outersides by a deep and well defined longitudinal sulcus reaching from some distance from the apex to the base, both disk and sides roughly foveate, median impression on the former very indistinct except beyond the middle; elytra sinuated laterally in the anterior part, acuminated from beyond the middle to the apex, which ends in a short, sutural spine, convex in the anterior part and moderately depressed behind, faintly punctate-striate, with the intervals not raised, impunctate and separated at a distance of about one centimetre by a little quadrate patch of very fine punctures, and having on each side a moderately broad supra-marginal greyish-white pubescent band reaching from base to apex; the tessellation of the intervals of the elytra is rather indistinct; underside roughly punctured, the punctures pubescent. Length 26, width 10 mm.

Hab. Zambezia (Salisbury).

P. intrusa, n. sp.

Bright bronze on the upper and under sides; head very rugose, slightly pubescent, and with a median longitudinal, smooth, raised line; prothorax a little attenuated in the anterior lateral part, nearly straight from thence to the base, almost plane on the disk, which is deeply sulcate laterally from the median part to the base and has also two superimposed, round impressions on each side of the median longitudinal groove, which is very shallow and more distinct in the anterior part; elytra in the middle slightly broader than the basal part, moderately aculeate behind, bi-spinose on each side of the apex, with very short pubescence behind, deeply punctate-striate, with the intervals also deeply and closely punctured, the alternate ones tessellated; underside roughly punctured, with short pubescence. Length 20, width 8 mm.

Hab. Zambezia (Salisbury).

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P. cognata, n. sp.

Glowing coppery-red, with the lateral intervals of the elytra greenish; head foveate and with a small, median smooth space; prothorax a little attenuate laterally in front, parallel from the middle to the apex, slightly convex in the middle, with the outer sides hardly depressed, and without any lateral impression, the median one distinct only from the middle to the base, closely foveate, except in the central part, which is deeply punctured, and having on each side two small smooth spots, one in the apical angle, the other in the anterior part of the disk; elytra narrower in the middle than at the base, sharply acuminate behind, bi-spinose on each side at the apex, the sutural spine longer than the outer one, deeply punctate-striate, with the intervals narrow, convex, and closely punctured, the alternate ones with small, elongated, disconnected, smooth spots; underside and legs very rugose, tomentose, abdominal segments with a small, lateral, denuded spot, tarsi green. Length 24, width 9 mm.

Hab. Zambezia (Manica).

In shape and sculpture allied to *P. suspecta*, Fåhr., but without any lateral impression on the prothorax; the elytral intervals are more convex and the punctures much deeper.

Family MALACODERMATA.

TELEPHORINI.

Gen. MALTHODES, Kiesenw.

M. australis, n. sp.

Antennæ black, with the four basal joints flavescent, palpi black, eyes large; prothorax a little broader than long, slightly impressed laterally on the anterior part, and above the median part of the base deeply infuscate, with the anterior and posterior margins yellow; elytra very short, reaching only to the first abdominal segment, very divergent, deeply sinuate laterally, shagreened, with short pubescence; abdominal segments edged laterally with yellow, the last deeply incised apically; legs black, with the basal part of the tibiæ flavescent. Length 6½, width 1 mm.

Hab. Zambezia (Salisbury).

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Family TENEBRIONIDÆ.

MOLURIDES.

Gen. Amiantus, Fåhr.

A. octocostatus, n. sp.

Black, covered on the upper part with a dense, light-brown tomentum; head rugose; prothorax gibbous, a little retuse in the anterior part, covered with very broad, confluent punctures; elytra suborbicular, convex, dehiscent behind, and having on each side four sharp, highly raised, slightly tuberculated costæ reaching from the base to the posterior declivity, intervals and outer sides smooth; legs densely tomentose; underside glabrous. Length 16, width 10 mm.

Hab. Transvaal (Barberton).

Allied to *A. opacus*, Haag-Rutenb., but larger and with four distinct costæ on each elytron instead of three.

A. globulipennis, n. sp.

Black, with the elytra covered with a greyish tomentum; head very rugose; prothorax gibbous, a little compressed laterally in the anterior and basal part, deeply but regularly scrobiculate; elytra globose, very dehiscent behind, and having on each side five sharp, smooth, conspicuous costæ reaching from the base to the posterior declivity, the intervals broad and filled with closely set sharp granules, not so dense on the lateral part, and absent on the epipleuræ; legs rugose, with short pubescence. Length 20, width 13 mm.

Hab. Zambezia (Manica).

Allied to *A. octocostatus*, but larger; the prothorax is compressed laterally, which is not the case in *A. octocostatus*, and the elytra have five distinct smooth costæ on each side, instead of four subtuberculated ones.

A. mashunus, n. sp.

Black, but dark-brown on the elytra; head subscrobiculate; prothorax subgibbose, not deeply foveate, the foveæ confluent, central part with a longitudinal smooth line reaching from apex to

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base, and a semicircular, very deep impression on each side ; elytra with very short and not dense pubescence, much broader than the prothorax, the humeral angles slightly sloping, nearly plane in the anterior part, obliquely dehiscent behind, carinate laterally from the base to the median part, outer margin also carinate from base to apex, the dorsal part with three lateral, undulating, indistinctly defined costæ ; underside nearly glabrous ; legs rugose, tomentose. Length 13, width 9 mm.

Hab. Zambezia (Salisbury).

Allied to *A. undatus*, Haag-Rutenb. The elytra are a little less sloping at the humeral part, a little more plane on the disk, and with less undulating costæ; the legs are also more slender.

A. costatus, n. sp.

Black, covered with a brown tomentum ; head rugose ; prothorax gibbose, much compressed on each side of the median discoidal part ; elytra nearly truncate at the base, subquadrate for two-thirds of their length, dehiscent behind, plane, and with one lateral and two very sharp discoidal costæ, the lateral costa ending in a sharp point at the top of the posterior declivity ; underside nearly glabrous ; legs with very short pubescence. Length 10–14, width 6–8 mm.

Hab. Zambezia (Victoria Falls—between the Limpopo and Zambeze Rivers).

OPATRIDES.

Gen. Anomalipus, Guér.

A. (*Acmæus*) *podagricus*, n. sp.

Black, opaque, more or less densely covered with a brownish coating ; head with broad, close punctures, labrum and epistoma deeply incised ; prothorax very much ampliated in the anterior part, narrowed and sinuated from the median part to the basal angle, which is sharp and slightly projecting backwards ; the posterior part of the prothorax is narrower in the ♂ than in the ♀, convex, with the outer sides a little depressed, with very closely-set, equal punctures, and having two round impressions on each side of the disk ; elytra nearly parallel, not much broader than the base of the prothorax, more convex in the ♀ than in the ♂, in which sex they are moderately plane in the anterior part, convex and deflexed behind, finely granulose and with three raised lines on each side, and occasionally a faint trace of intervening lines ; legs very

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rugose, anterior femora thickly clubbed. In the ♂ the anterior and intermediate tibiæ are broadly dilated at the tip, the former with a short, outer, bi-spinose carina, and very broadly scooped out internally, with the upper edge of the inner part laminated and ending in a basal and an apical spine, while the apical part of the lower edge is produced in a long, inward spur, the intermediate tibiæ are very deeply incised inwardly above the apex which is also compressed outwardly, and the posterior tibiæ are a little attenuated at the base, but not bent. In the ♀ the anterior tibiæ have two long external teeth, and a straight lamina internally extending from the apex to the same distance as the first external tooth, and the intermediate tibiæ are a little bent, deeply grooved on the upper part and with a short, median spine on each side of the groove. Length 22–23, width 12–14 mm.

Hab. Zambezia (Manica).

Much smaller than *A. elephas*, Fåhr., but belonging to the same group; the anterior tibiæ are scooped out internally on the same plan, but the upper edge overhangs the cavity.

A. (*Acmæus*) *proximus*, n. sp.

Shape, size and vestiture of *A. podagricus*; the ♀ is however a little less convex, and in both sexes the elytra are more closely granulated, and the raised, smooth lines are replaced by a trilinear series of granules a little larger than those of the interspaces, with a faint trace of other intervening series; in the ♂ the anterior tibiæ are slender from the base to the median part, then suddenly dilated in a sub-quadrate shape, bi-dentate outwardly, broadly excavate underneath, with the upper part of the internal edge deeply incised so as to make it also bi-dentate, and the apical part of the lower edge is produced in a long broad spine directed inwardly, intermediate tibiæ a little bent, not much dilated at tip, but deeply incised above the apex, with the terminal part of the incision produced in a long inner spur; in the ♀ the posterior tibiæ are moderately slender and a little incurved, the anterior tibiæ are not dilated, nor laminated inwardly, and they are strongly bi-dentate externally. Length 21–22 mm.

Hab. Zambezia (Salisbury).

A. (*Acmæus*) *plebeius*, n. sp.

Black, covered with a greyish coating; head and prothorax deeply and closely punctured, prothorax very broadly ampliated

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laterally, deeply sinuated behind from a little beyond the median part, and with the posterior part narrower than the anterior, moderately convex, with the sides somewhat depressed, bi-impressed on each side of the anterior part of the disc, and with a basal sub-lateral longitudinal impression ; elytra not broader at the base than the posterior part of the prothorax, but broadening a little below the humeral angles and nearly as broad in the middle in both sexes as the prothorax at its widest part, convex, dehiscent behind and with six distinct, narrow costæ on each side. In the ♂ the anterior tibiæ are moderately dilated at the tip, bi-dentate outwardly, while the inner part is contorted and has a broad, semicircular groove, the lower edge is sub-quadrate and bi-dentate, with the basal tooth pointing downwards, intermediate tibiæ incurved, deeply incised inwardly, with the terminal part of the incision produced in a long inner spur, posterior tibiæ moderately slender and a little incurved ; in the ♀ the anterior tibiæ are strongly bi-dentate outwardly and not laminate internally. Length 19–22, width 11–12 mm.

Hab. Zambezia (Salisbury).

Allied to *A. lineatus*, Gerst., in shape and sculpture, but is easily differentiated by the shape of the anterior tibiæ.

A. (*Apodemus*) *marshalli*, n. sp.

Black, moderately shining, elytra with a light brown coating ; head punctulate, and with two round impressions in the posterior part ; prothorax ampliate laterally in the middle part, a little narrower in the posterior than in the anterior part, basal angle sharp, disk moderately convex, depressed laterally, punctured and with two apical rounded impressions at the apex, two more on the median part, and two on each side, the intervals separating these impressions being smooth ; elytra moderately plane, convex and dehiscent behind, nearly straight laterally, and set with series of short, rounded, tubercles which are a little more raised in the alternate series ; anterior tibiæ of the ♂ slender, curving but not much dilated at the apex, bi-dentate outwardly, the inner apical part with a sharp spine pointing downwards, intermediate tibiæ slightly grooved outwardly and with a short median spine on each side, apical part a little dilated. Length 26, width 13 mm.

Hab. Zambezia (Salisbury).

Easily distinguished from any other South African species by the tuberculated elytra.

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A. segnis, n. sp.

Black, with a very slight greyish-brown coating; head punctulate, with two small median impressions; prothorax broadly ampliated in the median part, sinuate behind, somewhat depressed on the disk, with the outer sides flattened, closely but not deeply punctured and with two very faint, rounded, discoidal supra-basal impressions; elytra parallel, plane, slightly wider at the base than the posterior part of the prothorax, costate, costæ not much raised, and intervals narrow, both striæ and intervals densely granulose; legs moderately slender; anterior tibiæ of the ♂ a little curved, bi-dentate outwardly, apical part dilated inwardly, grooved and with a broad, sharp carina underneath, intermediate tibiæ slightly sinuated outwardly towards the apex. Length 22, width 11 mm.

Hab. Zambezia (Manica).

Allied to *A. planus*, Fåhr., and *A. affinis*, Pér.; but the anterior tibiæ end differently, and have not the conspicuous apical inner spine directed downward; the costæ on the elytra are very well defined and regular.

EUTELIDES.

Gen. Byzacnus, Pasc.

B. capensis, n. sp.

Head, prothorax and legs piceous-brown, median part of the prothorax with a sub-metallic sheen, elytra dark metallic-green; head very closely punctured, antennæ short, reaching only the median part of the prothorax, which is much depressed, as long as broad, sinuate and a little narrowed behind, closely foveate, with the foveæ small; elytra not broader at the base than the posterior part of the prothorax, gradually ampliated laterally in a triangular shape from the base to two-thirds of the length, and from thence abruptly truncate, while the disk is also gradually raised, although plane, from the base to the top of the declivity, which like the discoidal and lateral parts are roughly foveate; tibiæ curved; underside punctulate. Length 11–13, width 6–7 mm.

Hab. Cape Colony (Port St. John).

Easily distinguished from its congener *B. picticollis*, Pasc., by the absence of tubercles on the declivous part of the elytra.

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Gen. Cyrtotyche, Pasc.

C. rikatlæ, n. sp.

Black, covered with a light brown tomentum; head very rugose, antennæ short, black; prothorax with a sharp lateral tubercle, and one equally long but perpendicular over it, and four more on the disk, which in the ♀ is broadly grooved in the centre, with the sides of the groove developed in two high tuberculated ridges; elytra elongated, retuse behind, not quite so broad at the base as the prothorax at its widest part, not ampliated behind in the ♂, a little broader past the median part in the ♀, very rugose and with three series of thick, sharp, conical tubercles on each side, longer in the ♂ and denuded and golden at the tip, lateral part with two series of smaller tubercles; legs rugose, tibiæ slightly curved in the ♂, much less so in the ♀. Length 15–16, width 6–7 mm.

Hab. Mozambique (Rikatla).

Differs from *C. satanas*, Pasc., in the shape and disposition of the tubercles on the prothorax and elytra.

MEGACANTHIDES.

Gen. Micranterus, Sol.

M. scaberrimus, Fairm., Ann. Soc. Ent. Belg., xxxviii., p. 327.

Fairmaire has given, *loc. cit.*, the diagnosis of the ♀ only; the ♂ is elongate-ovate, with the elytra much narrower than those of the ♀, the granules are larger and denser, the dorsal costæ are ill-defined, although the granules of which they consist are larger than those in the intervals; the anterior and intermediate tibiæ are deeply emarginate internally from near the median part to the apex, the anterior femora are sub-dentate apically, and both the intermediate and posterior legs are fringed with long, flavescent pubescence. Length 20, width 10 mm.

Hab. Mozambique (Rikatla).

M. limpopoanus, n. sp.

Black, opaque, more or less densely covered with a light brown tomentum; head closely and finely punctured; prothorax a little attenuate laterally at both ends, broader than long, moderately convex with the anterior part slightly declivous, disk closely but irregularly punctured; elytra elongate-ovate (♂) or sub-globose (♀), declivous behind, and with large, closely-set granules, a little sharper in the ♂ than in the ♀; anterior and intermediate tibiæ

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of the ♂ deeply emarginate internally as in all *Micrantereus*, anterior femora sub-dentate at apex; underside punctured; legs very rugose. In the ♀ the legs are shorter, the tibiæ not emarginate inwardly, and the anterior femora not dentate. Length 18½–20, width 11–12 mm.

Hab. Upper Limpopo River.

M. carinatus, n. sp.

Black, covered on the upper part with very short tomentose pubescence, which is denser and a little longer on the elytra; head and prothorax very finely and closely punctured, prothorax a little attenuate laterally in front and behind; elytra elongate-ovate in the ♂, convex and gradually dehiscent behind, bi-costate on each side, the costæ consisting of elongated, coalescing, short tubercles, with the intervals irregularly tuberculated, suture smooth, raised; in the ♀ the elytra are more convex and therefore more abruptly declivous behind and they have three distinct, sub-tuberculate costæ on each side; legs rugose, anterior femora not sub-dentate in the ♂, intermediate tibiæ so deeply emarginate inwardly that the base of the sinuation is almost toothed; underside black, shining, punctulate. Length 19–21½, width 11–13 mm.

Hab. Betchuanaland (Ramoutsa), Upper Limpopo.

Larger than *M.* (*Solenomerus*) *longipes*, Fåhr., proportionally more massive, but while in *M. longipes* the dorsal longitudinal series of tubercles are hardly more raised than the tubercles in the intervals, and are thus very indistinct, they are very well defined in the present species, more raised, and although closely sub-tuberculated, often smooth and carinate on the posterior declivity.

M. luctuosus, n. sp.

Black, covered with a greyish tomentum; head and prothorax shagreened, the latter as broad as long and hardly attenuate laterally at apex and base; elytra elongated, very little ampliated laterally in the median part, not much attenuated, and not very abruptly declivous behind, each elytron with two discoidal series of more or less elongated and coalescing tubercles or rather large granules, with a few sub-seriated ones on the first and second intervals, and a double or treble irregular series between the second tuberculate costa and the sub-carinate supra-lateral part; legs long, the anterior and intermediate tibiæ sinuate inwardly as

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usual, but the posterior ones, which are very slender in comparison with the others, are sinuate outwardly and deeply emarginate in the inner part a short distance from the base to the apical part; basal joint of anterior tarsi triangular, not emarginate externally. Female unknown. Length 15, width 7 mm.

Hab. Mozambique (Rikatla).

Easily distinguished by the incurved posterior tibiæ; this character occurs also, but in a lesser degree, in the ♂ of *M. gratiosus*.

M. gratiosus, n. sp.

Black, moderately shining; head and prothorax finely punctulate, the latter broader than long, rounded laterally at base and apex; elytra elongated, very little ampliated in the middle, nearly plane in the anterior part and with a long posterior slope, covered with irregular, sharp, short tubercles closely set, and not disposed in series, supra-lateral part sharp, almost carinate, lateral part subfoveate. Female unknown. Length 15–17, width 8–8½ mm.

Hab. Zambezia (between the Zambeze and Limpopo Rivers).

Elytra narrower than in *M.* (*Solenomerus*) *longipes*, Fåhr., less convex, and much less retuse behind, with the outer sides more carinate, and the prothorax more plane and acutely carinate laterally; the basal joint of the anterior tarsi is triangular and not emarginate internally as in *M. longipes, carinatus*, etc.

M. spurius, n. sp.

Black, covered with a light brown tomentum; head and prothorax very shortly setulose, the latter hardly convex, carinate laterally; elytra of the ♂ ovate, convex, gradually sloping behind, supra-lateral part sharp, carinate, densely granulose and with two series of small tubercles on each side, the space between the first series and the suture also tuberculated irregularly. In the ♀ the prothorax is a little more convex and has a round smooth spot on each side, and the punctures are also deeper; the elytra are very convex, abruptly declivous behind, with the granules and tubercles smaller and the two discoidal series better defined. Length 14–15, width 8–9 mm.

Hab. Zambezia (between the Zambeze and Limpopo Rivers, Manica).

The ♂ is closely allied to the same sex of *M. gratiosus*,

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but the elytra are more ampliated laterally and less elongated behind. I am not quite sure that the ♀, which I describe from one example only, is truly that of *M. spurius*.

M. fallax, n. sp.

Black, moderately shining; head and prothorax as in *M. spurius* and *M. gratiosus*; elytra elongate-ovate, depressed on the anterior part of the disk, and gradually sloping from the median part to the apex in both sexes, broader at the base in the ♀, covered with closely-set granules not large enough to be called tubercles, and having on each side two lines of more or less coalescing small tubercles—the outer line is the best defined of the two, the supra-lateral part sharp in both sexes and densely granulate; basal joint of the anterior tarsi not emarginate. Length 15–16, width 9½–10mm.

Hab. Zambezia (Upper Limpopo).

Easily recognized by the depression of the basal part of the elytra and the gradual sloping towards the apex.

M. ovampoanus, n. sp.

Black, moderately shining; prothorax a little convex, somewhat attenuate laterally in front, one-third broader than long, slightly sloping at apex, nearly smooth; elytra of the ♂ elongate, rather convex from the median part of the disk, sub-aculeate behind and gradually sloping, supra-lateral part sharply carinate, anterior part of the disk smooth, the rest with short tubercles, irregularly set but forming somewhat indistinct series on each side of the posterior declivous part; basal joint of the anterior tarsi not emarginate inwardly. In the ♀ the elytra are very convex, covered with a greyish-brown tomentum, and the basal part near the scutellum is nearly smooth; they are densely granulose, and the two dorsal series of larger granules are distinct. Length 15–17, width 9 mm.

Hab. Ovampoland.

A little more aculeate behind and less declivous than *M. longipes*, Fåhr., of which it is a very close ally. The ♂ is distinguished by the denuded space at the base of the elytra, as well as by the form of the basal joint of the anterior tarsi, which is not emarginate.

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M. devexus, n. sp.

Black, shining; head punctulate; prothorax very closely punctured, the punctures elongate, irregular and confluent, disk not very convex, lateral part a little attenuate in front and behind; elytra in the ♂ nearly parallel laterally, almost plane from the base to the median part of the disk, where it is sub-convex and gradually sloping from thence to the apex, the posterior part sub-aculeate, the supra-lateral part acutely carinate from base to apex, the carina tuberculose, the median part of the disk rugose and without any serrated granules, but alongside the lateral carina the granules are dense; basal joint of the anterior tarsi very broadly triangular, not emarginate inwardly. In the ♀ the elytra are convex, covered with an earthy tomentum, hardly granulate on the anterior part of the disk, except along the supra-lateral carina, which is sharply defined, and with a few moderately large granules on the posterior declivous part. Length 13-14, width 6-7 mm.

Hab. Mozambique (Rikatla).

M. pronus, n. sp.

Black, moderately shining; head and prothorax closely but not deeply punctured, the latter a little attenuate in front and behind, slightly convex in the posterior part of the disk and dehiscent in front; elytra nearly parallel in the ♂ from the base to two-thirds of their length, and sub-acuminate from thence towards the apex, plane on the disk near the base, gradually dehiscent from the median part, rugose in the centre, and broadly verrucose laterally alongside the supra-lateral carina, which is very sharp; basal joint of the anterior tarsi broadly triangular. In the ♀ the elytra are more convex along the suture, more abruptly dehiscent behind, with the lateral granulation less pronounced, and there is a trace of two series of larger granules on each side of the declivity. Length 15-15½, width 9 mm.

Hab. Transvaal (Barberton).

M. algoensis, n. sp.

Black, covered with a light brown tomentum; head and prothorax very closely punctured, hardly ampliate in the middle, moderately convex and shortly dehiscent in the anterior part; elytra nearly straight laterally from a very short distance from the humeral part, rather plane than convex on the disk, abruptly

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retuse behind, the supra-lateral part carinate, the carina serrulate, the disk with a sharp, median smooth ridge on each side, ending suddenly at the top of the posterior declivity, the interval between the suture and the dorsal ridge smooth, the other interval with an indistinct series of very small tubercles. Length 15, width 9 mm.

Hab. Mozambique (Rikatla).

Easily distinguished from all the other described South African species of *Micrantereus* by the smooth dorsal ridge ending abruptly at the top of the posterior declivity in an acute point, in exactly the same manner as in *Amidntus carinatus*, of the group Molurides. In the male the posterior declivity is not so abrupt as in the female, and the apical part of the dorsal ridge is, therefore, not so marked; the tubercles in the interval between the median ridge and the supra-lateral part are more seriate; and the intermediate and posterior tibiæ are as much incurved as they are in *M. gratiosus*, of which the present insect may prove to be a variety.

Acastus, n. gen.

Mentum as in *Hoplonyx*, Thoms., last joint of maxillary palpi securiform, labrum transverse, truncate in front, eyes large, divided on the vertex by a mere line, supra-antennal crests produced in a coalescing semicircular ridge overhanging the anterior part of the head; antennæ not reaching the median part of the elytra, massive, the joints sub-moniliform, the median ones slightly dilated inwardly and somewhat serrate, the apical ones sometimes more or less pyriform; prothorax plane, as broad as long, a little rounded in front laterally, but with the posterior angles very sharp, carinate laterally; elytra sub-oblong, parallel, broader than the prothorax, not very convex; legs moderately long, anterior tibiæ deeply sinuate at the base, anterior femora with a broad conical tooth near the apical part.

Distinguished from *Hoplonyx* by the shape of the antennæ, the joints of which are shorter, much more massive, the third not longer than the first; the supra-antennal crests are much developed and coalesce in the middle.

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Synopsis of Species.

Prothorax with a small discoidal impression on each side, and a broader one in the median part of the base . . *segnis*.
Prothorax with small tubercles . . . . . *rusticus*.
Prothorax with a short median raised line only . . . . *agrestis*.
Prothorax with two deep longitudinal lateral impressions, . *impressicollis*.

A. segnis, n. sp.

Dark brown, with short and dense pubescence ; antennæ black ; labrum and epistoma pubescent ; prothorax straight laterally, the sides very slightly sinuate anteriorly, with the anterior angles rounded, and bi-sinuate posteriorly, with the hind angles sharp, plane on the disk, but slightly sloping near the anterior margin, roughly and closely punctured, and having a median, ill-defined longitudinal smooth line running from base to apex, and a median discoidal impression on each side of the line, while the median part of the base is broadly impressed ; elytra truncate at base, sub-cylindrical, slightly dehiscent behind, sharply carinate, the intervals narrow and with a series of moderately broad but deep punctures ; underside thickly clothed with very short pubescence ; legs rugulose, pubescent. Length 13, width 5 mm.

Hab. Zambezia (Salisbury), Mozambique (Rikatla).

A. rusticus, n. sp.

Brown, with the antennæ black, with very short pubescence; head as in *A. segnis* ; prothorax slightly sinuate at the sides behind the median part, covered with closely-set, deep, moderately broad punctures, broadly impressed longitudinally on each side of the median part, the outer part of the impression bounded by a low, well-defined ridge, with a short tubercle in the middle, central part of the median impression also with a small rounded tubercle, in a transverse line with the other two ; elytra sub-cylindrical, carinæ sharp, punctures of the intervals deep ; underside and legs with short pubescence. Length 7¼, width 3½ mm.

Hab. Zambezia (Salisbury).

A. agrestis, n. sp.

Brown, with moderately long pubescence on the upper part, antennæ brown ; head as in the two preceding species ; prothorax sinuate at the sides behind the median part, anterior part of the

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disk slightly convex, median part a little depressed longitudinally, base deeply impressed above the scutellum, disk closely foveate, the foveæ small, and with a median longitudinal smooth line reaching neither base nor apex; elytra sub-cylindrical, sharply carinate, punctures of the intervals deep, pubescence long; underside and legs with short pubescence. Length 7, width 3 mm.

Hab. Zambezia (Salisbury).

A. impressicollis, n. sp.

Brown or rusty-red, with the elytra and legs a little lighter than the prothorax and antennæ; head as in the preceding species; prothorax with dense, short pubescence, rounded at the sides in the anterior part, sinuate near the base, disk a little convex in front, moderately plane from the middle to the base, and having on each side of the median part a very broad and deep pyriform impression, while the lateral posterior part and also the median part of the base are slightly impressed; elytra sub-cylindrical, less pubescent than the prothorax, acutely carinate and deeply punctate-striate; legs and underside as in the preceding species. Length 6, width 2 mm.

Hab. Zambezia (Salisbury).

In *A. impressicollis* the intermediate joints of the antennæ are more moniliform from and including the sixth than in the other species.

ASYLEPTUS, n. gen.

Mentum as in *Acastus*; maxillary palpi with the last joint triangular, bluntly truncate; antennæ moderately long, and moderately thick, conical, the joints of nearly equal length, except the basal one which is the longest, and the apical one which is a little shorter, slender at the base, sub-pyriform at the tip and less thickened than either of the two preceding joints; eyes separated by a narrow line on the vertex; frontal crests produced in front, meeting in the centre, and perpendicularly carinate; prothorax and elytra as in *Acastus*; legs more slender and a little longer than in that genus, anterior tibiæ not sinuated inwardly, the anterior femora without any conical tooth.

A. fumosus, n. sp.

Piceous, opaque, glabrous, antennæ, palpi and legs reddish-brown; labrum and epistoma closely punctulate; frontal part produced in two projecting much raised crests, united in front, and

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carinate along the point of insertion of the antennæ; prothorax nearly straight laterally, truncate in front, bi-sinuate at base, plane, a little dehiscent in the anterior part, glabrous, closely punctured and with two faint impressions, one on each side; elytra sub-cylindrical, sharply carinate, intervals closely and deeply punctured, the punctures in the first and second intervals not so deep as in the others; underside glabrous, with the exception of the abdomen, which is clothed with very short pubescence. Length 9, width 3¼ mm.

Hab. Cape Colony (Kowie River).

Family CERAMBYCIDÆ.

Subfamily LAMIINI.

Gen. Brimus, Pasc.

B. pascoei, n. sp.

Black, covered with a very short, slightly greyish tomentum, lateral part of the scutellum, of the meso- and metasternum, and also of the abdominal segments, clothed with a bright ochraceous pubescence; head rugulose, clypeus distinct, vertex deeply and broadly grooved, frontal and hind part with a very fine groove; the two basal joints of antennæ black, the others rufescent; prothorax as long as broad, sharply aculeate laterally at the middle, grooved transversely in front and behind, median part of the disk slightly raised in the shape of a lozenge and narrowly grooved longitudinally; elytra three times as long as the prothorax, elongate-ovate, with the sutural part incised at the apex, very convex in the middle, gradually sloping behind, a little broader at the base than the hind part of the prothorax, with the humeral angles diagonal and produced in a short tubercle, granulated for about one-fifth of their length, punctured from the base to about the median part and not punctate behind; legs with long pubescence, tibiæ dilated from the median part to the apex, the intermediate ones almost laminated outwardly. Length 29, width 10 mm.

Much larger than *B. spinosus*, Pasc., and without any basal tubercle on the elytra, which are not mottled with grey.

Hab. Transvaal (Potchefstroom).

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Gen. STERNOTOMIS, Perch.

S. mozambica, n. sp.

Black, covered with a thick ochraceous tomentum; mandibles massive, with two small rounded tubercles on the outer basal part in the ♂; anterior part of the head finely granulate, apical part of the vertex with a semicircular impression followed by a longitudinal median line, eyes large: prothorax transverse, with the median part of the outersides aculeate, bi-impressed transversely at apex and base, median part of the disk also with a transverse impression, slightly sinuate in the middle, in front and behind; elytra sub-cuneiform, broader at the base than the prothorax, and with the shoulders projecting a little, but rounded and not tuberculated, gradually attenuate behind, set with moderately close granules at the base, and irregularly punctured; intercoxal process of the prosternum hollowed, narrowed and rounded in front; antennæ twice the length of the body in the ♂, finely granulose and pubescent. Length 27, width 10 mm.

Hab. Mozambique (Rikatla).

TIMORETICUS, n. gen.

Head, eyes, labrum and palpi of *Zographus*, Cast.; antennæ of equal length in both sexes, with the 2nd, 3rd and 4th joints much thicker than the others; prothorax short, with a conical lateral tubercle; elytra sub-cylindrical, with the humeral angles well developed; intercoxal part of the mesosternum without any projection, that of the metasternum sub-aculeate and hardly projecting; legs as in *Zographus*.

Allied to *Zographus*, but easily distinguished from it in having antennæ of equal length in both sexes, and the 3rd, 4th and 5th joints much thicker than the others; the prothorax is less hexagonal, the metasternal projection is differently shaped, and the elytra are more cylindrical.

T. armaticeps, n. sp.

Chocolate-brown, very finely and thickly pubescent; frontal part of the head with a very narrow median ridge, ♂ with a long, flat, sub-vertical median lamina excavate in the centre, vertex with a semicircular groove, followed by a longitudinal median one; prothorax one-third broader than long, with the median part of the outersides produced in a sharp tubercle, deeply impressed transversely in front and behind, and with the intermediate part some-

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what bi-plicate; both head and prothorax are clothed with a slightly ochraceous pubescence; scutellum transverse, sub-quadrate; elytra sub-parallel, a little broader at the base than the prothorax across the median part, sinuate laterally at the base in such a way as to make the humeral angle very prominent, a little attenuate gradually towards the apex, convex, closely punctured, and covered with a very fine, short, slightly greyish pubescence, sprinkled with minute light ochraceous or whitish spots, and having also two broader ones at the base on each side of the scutellum; underside and legs densely pubescent; the 4th joint of the antennæ is slightly constricted near the apex, and all the joints are pubescent and ringed with brown at the tip from the fourth to the last one. The ♀ has no trace of the frontal process. Length 21–22, width 7½–8 mm.

Hab. Mozambique (Rikatla); Transvaal.

In the examples from Rikatla the white speckles on the elytra are much more conspicuous than in those from the Transvaal.

Gen. TRAGOCEPHALA, Cast.

T. rikatlæ, n. sp.

Densely covered with a very short black velvety pubescence; antennæ and legs velvety-black; head and prothorax bright sulphur-yellow, the latter with a narrow median longitudinal black band reaching from the base to the apex, the lateral part of the prothorax aculeate in the middle; elytra as broad as the prothorax in the median part, a little attenuated behind, depressed, and with four broad transverse bands on each side edged with white, separated by a narrow band of the black ground-colour and reaching from the outer margins to near the suture, but disconnected from it; the first, second and fourth bands are of nearly equal breadth, but the third one is narrower and divided in two at about the median part by a diagonal narrow black line; underside with a broad bright yellow lateral band running from the sides of the mesosternum to the apex; legs bright yellow. Length 15, width 5 mm.

Hab. Mozambique (Rikatla).

At once distinguished from the other South African species by the narrow black median line of the prothorax, and the very broad yellow bands of the elytra, which have very nearly invaded the whole of the surface.

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Gen. CEROPLESIS, Serv.

C. manicana, n. sp.

Black, the elytra bluish-black, with short pubescence; head with two frontal, longitudinal red bands; prothorax constricted at base and apex, tuberculated laterally beyond the median part, subtuberculated and rugose on the disk, anterior and posterior constrictions banded with pale vermilion; elytra elongated, gradually narrowed from the base to the apex, which is rounded, convex, deeply and closely punctured all over, but more deeply in the basal part, which has a brassy tinge, and having two transverse, non-sinuate vermilion-red bands reaching from side to side, one supra-apical one, sinuate laterally, one apical patch, and a supra-marginal dot between the post median and the supra-apical bands; epipleuræ red from the base to the median part; underside pubescent, meso- and metasternum each with a lateral red patch. Length 30, width 10 mm.

Hab. Zambezia (Manica).

In the ♂ the elytra are more acuminate behind than in any other South African species known to me.

C. fallax, n. sp.

Black, with a very short, greyish pubescence; frontal part of the head with two longitudinal pale vermilion-red bands and a transverse apical one; prothorax constricted at base and apex, tuberculated laterally beyond the median part, rugose on the disk, the anterior and posterior constrictions banded with pale vermilion-red; elytra cylindrical, finely and closely punctured, each puncture bearing a very short, greyish hair; their basal part has no bronze tinge, and they have a sub-humeral pale vermilion-red band reaching neither the outer margin nor the suture on each side, two median ones, moderately broad, reaching the outer margins, another band reaching from the outer margin to the median part of the disk or sometimes to near the suture, a sub-sinuate supra-apical one reaching from side to side and an apical patch coalescing along the margin with the supra-apical band; epipleuræ red from the base to the median part; underside more densely pubescent than the upper, lateral part of the meso- and metasternum, as well as of the abdominal segments, the last one excepted, red. Length 26, width 9 mm.

Hab. Zambezia (Salisbury).

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Very closely allied to *C. malepicta*, Fairm., but with the subhumeral band of the elytra better defined, the two median bands a little broader, and the supra-apical one uninterrupted.

Family CURCULIONIDÆ.

BRACHYDERIDES.

Group *TANYMECINÆ*.

Gen. Polycleïs, Bohem.

P. sumptuosus, n. sp.

Oblong-ovate, black, densely covered with green scales, elytra with two greenish-white lateral patches, of which the anterior one situated above the median part is the broadest of the two, the other, a small one, is equidistant from the median and apical parts, and a little beyond the median part of the disk there is a transverse band reaching on each side from the middle of the elytra to the suture; rostrum grooved horizontally in the central part only, and slightly carinate at the apex; prothorax gradually ampliated from the apex to the base, with the outer sides straight, twice the width of the apex at the base and with the basal angles sharp and projecting backward, very finely punctured and without any median groove; scutellum elongate, rounded at the apex; elytra nearly twice as broad near the base as the prothorax at its widest part, but with the outer angles sloping, and the shoulders sub-tuberculate, gradually narrowed behind, very convex, and with the suture acuminate on each side at the apex, striate, but not deeply, and with the anterior part distinctly punctured, the punctures, however, being generally hidden by the green squamæ; antennæ and tarsi black and covered with a thick, white pubescence. Length 20, width 8 mm.

Hab. Zambezia (Buluwayo).

Belongs to the group of *P. equestris*, Boh., and *P. cinereus*, Fåhr., but neither the prothorax nor the elytra are quite so much ampliated.

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P. prasinus, n. sp.

The description of the preceding species applies to the present one but the elytra have no greenish-white patch whatever, and the whole of the upper part is not only densely squamose but also briefly and densely pubescent and the prothorax is a little less attenuate in the anterior part. Length 20-21, width 7-7¾ mm.

Hab. Zambezia (Buluwayo).

P. decorus, n. sp.

Black, covered with a very short, greyish pubescence; prothorax with a moderately broad, lateral whitish band; elytra with a lateral whitish band beginning near the shoulder, broadly dilated before the median part where it reaches the fourth costa, narrowed from thence and running along the seventh and eighth intervals to a short distance from the apex, also with a diagonal band of the same colour extending from the third interval to the suture, a little beyond the median part of the disk; head and rostrum longitudinally plicate, the former with a median longitudinal groove; prothorax not broader than the head at the apex, gradually ampliated from the apex to the base, the outer angles of which are distinctly acute, very closely granulate and with a narrow, shallow, pubescent median longitudinal groove; elytra almost truncate at the base, with the shoulders hardly sloping, a little attenuate behind, but not at all dilated laterally in the median part, punctate-striate from the base to the middle, with the intervals slightly raised and rounded; underside with long pubescence; the joints of the tarsi broad, the terminal one not very much broader than the others. Length 17, width 6 mm.

Hab. Zambezia (Salisbury).

Allied to *P. longicornis* and *P. vestitus*, Fåhr. It differs from the former in having comparatively short and more slender antennæ; the prothorax is narrower; the lateral white lunule of the elytra projects more towards the centre and is produced behind in a narrow band, and the sutural, post-median patch is in the shape of a diagonal band, the elytra themselves also being broader.

Gen. Cimbus, Schönh.

C. viridanus, n. sp.

Black, covered with green scales, these being denser along the outer part of the prothorax and elytra; rostrum a little narrower at apex than at base, grooved from the basal part to near the apex,

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neither head nor apex constricted, eyes projecting; prothorax subcylindrical, but a little broader at the base than at the apex, and with the basal angles somewhat sharp, a little depressed longitudinally in the middle and with a very narrow groove; elytra elongate, convex, attenuate laterally from the median part to the apex, which is acuminate on each side of the suture, striate, with the striæ distinctly punctured from the base to the middle, intervals slightly convex; the green scales are denser in the intervals than in the striæ, making the dorsal part appear as if it had alternate green and black lines, but the green scales are very dense along the sides; the prothorax has also a broad supra-lateral denuded band on each side; legs black, with short pubescence. Length 13–14, width 4–4½ mm.

Hab. Zambezia (Salisbury).

BRACHYCERIDES.

Eureius, n. gen.

Head short, eyes flat, surmounted by a very high compressed carinate crest; rostrum moderately long, slightly bi-constricted laterally, near the base and below the scrobe; antennæ short, and with seven articulations, the scape also short, the 2nd joint equally thick but still shorter, the 3rd joint a little narrower than the following three, the last joint as long as the three preceding, and with the outer part of the tip diagonally truncate; prothorax very slender, and narrower behind than in front; elytra very gibbose, sub-pedunculate, retuse behind; legs very massive, tarsi short, very broad, with the 2nd joint a little broader than the others, and the 4th not much longer than the 3rd, equally broad, all closely articulated.

E. aurivillii, n. sp.

Black, with the median part of the head, the prothorax, a narrow sutural line, as well as the sides of the elytra, and the legs ochraceous-brown; rostrum with a few short bristles, separated from the head by a slight lateral impression; head very short, eyes surmounted by a semicircular compressed, very highly raised ridge, having a few very short bristles on the margin; prothorax narrow, almost straight laterally, a little narrower behind, deeply

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pitted and with two conspicuous sharp spines on each side of the central part of the disk, and also a row of smaller ones on the lateral part; elytra very gibbose, sub-pedunculate, retuse behind and having on each side two rows of regularly set conical tubercles reaching from base to apex, sides regularly and broadly foveate. Length (rostrum excluded) 8, width 3½ mm.

Hab. Cape Colony (Albany).

Gen. Brachycerus, Oliv.

B. indutus, n. sp.

Black, covered with a very dense squamiform, light brown tomentum; scape of antennæ cylindrical, not narrowed at the base, and short; rostrum long, bluntly bi-tuberculate at the base, sinuate laterally and gradually broadening towards the apex, eyes without any supra-orbital ridge; head small; prothorax broader than long, with the median part of the sides pluri-tuberculate and projecting, anterior margin broadly sinuate laterally, anterior part not projecting, disk moderately convex and with a broad median longitudinal groove interrupted in the middle, posterior margin straight, deeply and irregularly foveate all over; elytra convex, truncate at the base, declivous behind, somewhat ovate, having on each side five series of closely-set sharp tubercles, and four more along the sides, these lateral tubercles being blunt, the intervals between the series of dorsal tubercles foveate, covered with a dense light-brown tomentum, and at the base, there is on each side of the scutellary region an elongated and conspicuous tubercle covered with a velvety-black tomentum; legs thick, bristly. Length (rostrum excluded) 10–15, width 6–9 mm.

Hab. Cape Colony (Vaal River), Mozambique (Rikatla).

B. divergens, n. sp.

Black, more or less densely covered with yellowish squamæ; rostrum long, bi-tuberculate and constricted at the base, gradually dilated from the stricture to the apex, foveolate, and with short setæ; scape of antennæ incurved, clubbed at the tip, as long as the four following joints together, terminal joint thickened; eyes without orbital ridge; prothorax deeply sinuate laterally in the anterior part, and with the median part projecting, broadly and deeply grooved longitudinally from the apex to about the median part of the disk, closely tuberculated, with the intervals deeply foveate, and with the median part of the outer sides pro-

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duced in a very sharp triangular pluri-tuberculated spine; elytra very convex, sub-globose, moderately retuse behind, with three rows on each side of well-developed and somewhat sharp tubercles, and two intermediate ones smaller and blunter in the intervals, the first one running alongside the suture from the base almost to the apex, the second stopping short of the posterior declivity, lateral part with three or four series of blunter tubercles; the intervals are sub-foveate and squamose, the squamæ are denser on the median part, where they form a distinct, more or less sinuate, small pale yellow patch on each side of the suture; legs thick, bristly. Length 14, width 8 mm.

Hab. Zambezia (Salisbury).

B. effertus, n. sp.

Black, densely covered with ochraceous scales; rostrum long, dilated triangularly towards the apex, separated from the head by a deep groove, and constricted below this groove and at a little distance from it, deeply foveate in the basal part, hardly so in the apical; head small, eyes elongate-ovate, depressed; prothorax sharply aculeate laterally in the middle, set on the disk with round, flattened tubercles, grooved in the median part from apex to base, the anterior part of the groove broad, deep, and limited by two rounded, tuberculated ridges, one on each side; elytra very convex, obovate, moderately retuse behind, and having on each side, besides a juxta-sutural one, four regular series of rounded, flattened, denuded tubercles, those of the alternate series much larger than the others, sides with several rows of smaller, regularly disposed tubercles, and all the intervals densely clothed with ochraceous scales; legs moderately thick, not very bristly, supra-apical end of femora ringed with lighter ochraceous scales. Length (rostrum excluded) 25, width 19 mm.

Hab. Zambezia (Salisbury).

Allied to *B. natalensis*, *B. brevicostatus*, Fåhr., etc.

ATTELABIDES.

Gen. Attelabus, Linn.

A. carneolus, n. sp.

Light testaceous-red with a fleshy tinge, glabrous; antennæ shorter than the head, black, with the two basal joints red; head plicate transversely, grooved longitudinally from the vertex to

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the base, and having a short, curved groove above each eye; rostrum much shorter than the head, dilated at the apex and closely punctured; prothorax elongate, very much attenuated in the anterior part, truncate and deeply grooved transversely at both ends, roughly plicate transversely and having a broad, lateral black band; scutellum sub-triangular, edged by a rounded, conspicuous ridge; elytra much broader than the prothorax, parallel, but very convex, although a little depressed in the anterior part, costate, with the second and fourth costæ more raised than the others and reaching the base, intervals closely foveate; they are of the same colour as the head and prothorax, but have a transverse darker median band extending from side to side, and ascending the suture a little, and a lateral black band reaching from the humeral angle to about the middle; sides of the meso- and metasternum with a lateral flavescent pubescent patch; abdomen closely punctured; legs strong, femora without spine, tibiæ serrulate inwardly. Length (rostrum excluded) 7, width 3¼ mm.

Hab. Natal (Durban).

Gen. APODERUS, Oliv.

A. gentilis, n. sp.

Head, prothorax, pygidium and underside vermilion-red; antennæ and legs flavescent; labrum edged with black; head smooth, slightly grooved in the median part of the apex; prothorax quite smooth and with a small lateral black dot; elytra flavescent, with a black basal transverse band and a somewhat sinuate supra-apical one, faintly seriate-punctate, and with two round basal costæ disappearing before they reach the median part. Length 5, width 2½ mm.

Hab. Zambezia (Salisbury).

With the exception of *Euretus aurivillii*, *Sternotomis mozambica*, *Tragocephala rikatlæ*, and the seven species of *Paussus*, the types of the insects described are contained in the South African Museum.

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VIII. *Descriptions of New Scolytidæ from the Indo-Malayan and Austro-Malayan Regions.* By Walter F. H. Blandford, M.A., F.Z.S.

[Read March 18th, 1896.]

The purport of this paper is to describe some of the more important unrecognized species of Scolytidæ from the Tropical Old World, which are in my collection. Thirty-three new species are distinguished, and of these about half were collected by Dr. A. R. Wallace during his travels in the Malay Archipelago. It is greatly to be regretted that his collections of this family, to which he paid some attention, have been broken up before any opportunity offered of their being dealt with as a whole.

The Platypodinæ were, it is true, described by Chapuis, and form no small part of the Old World species enumerated in his memoir, but the collections of the remaining subfamilies have been scattered, and I have been able to examine only the small number of specimens which passed into the possession of the late Mr. Wilson Saunders, and subsequently of myself. No attempt has been made to give an exhaustive account of that material. Some examples, especially of doubtful genera, are in an unfit state for critical examination; while species of *Cryphalus* and *Hypothenemus* are best dealt with when reviewing those genera, or any considerable section of them, *en masse*.

The wide range of the forms described, from Southern India to New Guinea, is to be justified partly by the homogeneous character, so far as is known, of the Scolytid fauna of the Eastern Tropics, partly by the fact that considerable collections of these insects are rarely made, and any attempt rigidly to confine descriptive papers to the fauna of limited regions must necessarily result in the multiplication of small papers, containing each descriptions of a very few species, which, though often necessary, are certainly inconvenient.

Among the more interesting novelties, attention may

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be called to *Platypus philippinensis*, *Scolyto-platypus eutomoides*, *Tomicus perexiguus*, *Xyleborus colossus*, *X. globus*, *X. scabripennis*, *X. arcticollis*, and *X. spatulatus*, all of which present considerable differences from any of their known congeners.

Crossotarsus cavifrons, sp. n.

Mas. Elongatus, badius, elytris apice infuscatis; fronte opaca, medio impressa; prothorace oblongo, sparsim punctato, punctis in lateribus sulci aggregatis; elytris punctato-striatis, ad apicem declivibus, pilosis, angulis postero-lateralibus productis, depressione terminali lunata, subtus juxta suturam utrinque dentata. Long. 3·6 mm.

Male. Rather elongate, bright brown, the elytra becoming gradually blackish towards apex. Front opaque, impunctate save towards the vertex, with a median impression, longitudinally sulcate from the vertex to the middle, its sides subcallose opposite the antennal insertion; vertex irregularly punctate on either side of the median striga and laterally with one or two deep pits. Prothorax a third longer than broad, scantily and irregularly punctate, with a series of deep points along the apical margin, impunctate over the median area anterior to the long and fine sulcus, which has one or two lines of aggregated but not pore-like punctures on either side of its anterior half. Elytra punctate-striate, the striæ impressed as usual at the base, interstices flat throughout, the first and alternate interstices with an irregular single series of finer punctures from the base, the others impunctate; apical fourth gradually declivous, convex, coarsely and irregularly punctate and shortly setose, not striate or granulate; postero-lateral angles produced downwards and backwards, acute, terminal impression lunate, concave, its lower margin with a tooth on each side external to the apex of the suture.

Hab. Gilolo (Wallace).

Two examples. Although the Platypodinæ collected by Wallace were described by Chapuis, the present form appears, for some reason, to have been overlooked; all my other specimens from the Wilson Saunders collection have passed through Chapuis's hands and bear his labels.

It is quite probable that the species here described is no more than the other sex of *C. indomitus*, Chap., taken by Wallace in the neighbouring island of Morty. What

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has become of the type of that insect I do not know, but without it association of the two forms as sexes is impossible. If this conjecture be correct, the male offers no valid reason for the separation of the species from the *Crossotarsi subdepressi*, as conjectured by Chapuis.

Platypus philippinensis, sp. n.

Mas. Nigro-piceus, nitidus; fronte plana, dense areolato-punctata; prothorace oblongo; elytris versus apicem subangustatis et in processus productis, fortiter punctato-striatis, interstitiis planis, similibus; processu utroque ab altero discreto, longo, acuto, postice producto et inferne curvato, in margine superiore dente acuto armato. Long. 6·3 mm.

Male. Pitchy-black, shining, subglabrous. Front flat, rugose with very close areolate punctures, finer towards the mouth, their interspaces forming a raised reticulum; vertex with strong substrigose punctures, the median and lateral smooth spaces evident. Prothorax a third longer than broad, the sulcus fine, not reaching the base, the punctuation distinct, sparse, rather closer towards the middle of the disc but absent along the middle line and the margins of the sulcus, strong and close in the hind-angles of the emargination and basal border, but not the apical. Elytra with very strongly punctured striæ, similar at the base, the punctures deep and subquadrate, isolated before the middle, then more or less confluent, the apical portions of the striæ sulcate and curved outwards; interstices flat, shining, similar throughout, closely punctate at the base, the alternate interstices alone with a series of microscopic points throughout, their apical portions much narrowed and subcostate, the 1st sulcate and split, its outer half curved outwards, the 3rd alone seriato-punctate; apices narrowed, produced backwards and somewhat downwards into two long acute processes, separated from each other by a space nearly as deep as broad and widened from the fundus to the apex of the processes, their upper border formed by the conjunction of the outer half of the 1st, and 2nd interstices, armed about the middle with an acute tooth directed backwards and inwards, and thence curved downwards, their lower border continuous with the 8th interstice and sinuate at its junction with the elytra, their inner face concave, continuous with the declivous median terminal portion of the elytra, which is internal to the everted half of the 1st interstice, longitudinally convex and rugose. Underside and legs concolorous; abdomen depressed, rugosely punctured.

Hab. Philippine Is.

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One example. This species differs so much from any described *Platypus* as to be referable to no existing division of the genus. Its nearest affinities seem to be with the *Platypi oxyuri*, or perhaps the *P. truncati*, of which not much is known. The abdomen is depressed and ascends somewhat from the base to the apex; but the species does not appear to possess any relationship with *Crossotarsus*, its maxillary structure being that of a normal *Platypus*. Its position in the genus will be much clearer when the opposite sex is known.

Platypus biuncus, sp. n.

Linearis; fronte bilineato-punctata et striga media impressa; prothorace elongato; elytris lineato-punctatis. Long. 2·8 mm.

Mas. Fusco-testaceus; elytris posterius infuscatis, ante apicem constrictis, haud declivibus, depressione postica lunata, angulis productis, emarginatione longiore quam latiore, haud dentata, ambitu superiore ad suturam transverso.

Fem. Pallide testacea; prothorace plaga cribriformi angusta, elongata, circa sulcum munito; elytris postice infuscatis, depressione apicali lunata, margine suturali quam margine inferiore breviore.

Linear, the front nearly flat, more shining in the male than the female, with a short impressed median striga situate between two longitudinal rows of punctures; vertex dull, without a shining space, with a few deep punctures. Prothorax a half longer than broad, the lateral emargination well-marked. Elytra about twice as long as the prothorax, finely lineato-punctate, the interstices scarcely visibly punctured.

Male. Testaceous-brown, the elytra infuscate posteriorly. Prothoracic sulcus rather long, with a group of 3 to 5 large punctures on each side of its anterior extremity, remainder of surface with irregularly mixed large and small punctures, absent round the hind part of the sulcus, apex and base narrowly strigillate. Elytra constricted before the terminal impression, the inner rows of punctures stronger, the 2nd, 4th, 6th, interstices impressed at the base and furnished with one or two granules: apical impression vertical, irregularly ovate, emarginate below to the middle, the emargination widening above and deeper than broad, the fundus biconcave, with prominent margins, transverse above at the suture, the apical processes produced downwards and backwards, closely approximate at the tip, their outer margin subangulate.

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FEMALE. Pale testaceous, the head and apex of the elytra infuscate. Prothorax with a narrow oblong patch of punctures round the sulcus, a little stronger in front, remainder of surface finely reticulate and feebly punctate. Elytral rows of punctures very feeble, 3rd interstice granulate at the base; apical depression lunate, rounded and not sulcate above, the postero-lateral angles acute, the inferior margin concave, much longer than the sutural margin, the fundus subconcave, rugulose and shortly hairy.

Hab. Sumatra, from tobacco (Grouvelle).

In spite of the examples having been found in tobacco-bales in Paris, there can be no question as to the original locality of this little species, one of the smallest of the subfamily. The male is distinguished from *P. forficula* and allied species by its size, extreme tenuity, and the deep apical emargination, which is narrowed at its mouth by the approximation of the postero-lateral angles. The female resembles that of *P. pallidus*, Chap., but is much more attenuated, and can be separated by the frontal sculpture.

Scolyto-platypus (*Tæniocerus*) *raja.*

Blandf. Tr. Ent. Soc., 1893, p. 440.

I have had the opportunity of examining a second specimen of the male from the Hope Collection. The example is brownish-black, and is less pilose than the type, especially on the head, a distinction which may however depend on differences in the length of life of the specimens; it has the elytral interstices more distinctly alternate on the declivity, the second being impressed. The characteristic hairs round the spines are present. I have been able to examine the prosternum, which differs decidedly from that of *S. mikado*, in the chitinous appendages of the prosternal organ. These instead of being incurved are widely divaricate, straight, and either abruptly bent inwards at the tip or furnished on the inner side with a tooth, like the barb of a fish-hook.

If, as is probable, this curious genus is rich in species, it is evident that the structure of this male organ of unknown function is likely to furnish differential characters of great value, and its careful examination is therefore indispensable.

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Scolyto-platypus (*Tæniocerus*) *eutomoides*, sp. n.

Mas. Breviter oblongus, opacus, fusco-ferrugineus, pedibus testaceis, pube quam brevissima flava pruinosus; fronte ad oculos excavata; prothorace quadrato, angulis posticis acutis, supra rudi, vermiculato-rugoso; ita elytris ad basin, sed ab antica tertia parte convexe subglobose declivibus, late subsulcatis, sulcis lineis carinatis postice obliteratis separatis. Long. 3 mm.

Male. Short, oblong, quite dull, fusco-ferruginous, covered with extremely short yellow pubescence, imperceptible unless seen sideways. Front impressed and concave to the eyes, with an incised line from the vertex to the middle, the pubescence a little longer round the upper margin but not strong; antennæ with the characters of *Tæniocerus*, brown-testaceous, the club infuscate, not very elongate, pubescent, with a few long hairs towards the tip. Prothorax quadrate, broader than long, the lateral emargination of the sides scarcely present, the hind-angles acute, prominent and directed outwards, apical border very obtusely rounded, with no median emargination; surface dull and finely scabrous with an irregular corroded sculpture. Scutellum absent. Elytra a very little wider than the prothorax at its base and scarcely longer, subtruncate at the base, with very finely elevated margins, the shoulders rectangular, but somewhat rounded, the sides exactly parallel, the apex rather obtusely rounded; surface cylindrical for rather less than the basal third and sculptured like the prothorax, then declivous and convex, the declivity subspherically rounded, its upper half with six very shallow wide rough sulci, separated by fine carinate lines, obsolete behind, the lower half uniformly roughened. Underside concolorous, shortly pubescent, the abdomen dull and rugulose, with the first two segments completely connate; anterior flexed surface of the prothorax wide, prosternum with a raised carina crossing the flexed surface and becoming more elevated at the tip, below which the anterior margin is produced forwards, at its extremity are two short obliquely placed lobes, subquadrate, with the outer apical angle rounded and the inner acute. Anterior coxæ with a pencil of very long thick yellow hairs; anterior tibiæ coarsely scabrous externally, middle and posterior tibiæ slender; tarsi slender, elongate, somewhat less so than in *S. mikado*.

Hab. Celebes.

The colour, which is perhaps that of a somewhat immature example, and sculpture give the insect a

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certain resemblance to the species of *Eutomus* or *Rhipidandrus;* the main structural characters agree well with those of *S. mikado,* Blandf. I have received two specimens from Mr. O. E. Janson.

Hylesinus wallacei, sp. n.

Mas. Oblongo-ovalis, nigro-piceus, opacus; fronte impressa; prothorace grosse foveolato-punctato, apice et angulis anticis tuberculatis; elytris crenato-striatis, interstitiis uniseriatim, ad basin modo subirregulariter tuberculatis, et quam minutissime setosis. Long. 4·2 mm.

Male. Oblong-oval. Head black, opaque, front and rostrum widely impressed, subnitid, punctured and with a few minute appressed hairs; mouth reddish; antennæ brown-testaceous, the club elongate. Prothorax moderately transverse, widest about the base, the hind-angles rounded, the sides gently and regularly incurved to the apex; surface regularly and not strongly convex, piceous-black, opaque, subglabrous, with large deep foveolate punctures, close and in parts confluent; median impunctate line finely elevated behind, anterior margin with a row of tubercles, larger on the apical angles, the sides submuricate. Scutellum convex, transverse. Elytra twice as long as the prothorax, wider at the base, their basal margins crenate and elevated but not strongly rounded, the sides curved throughout, obliquely behind the middle; the apex not conjointly rounded; surface piceous, with strong crenately punctured striæ; interstices convex, uniseriately tuberculate, the tubercles stronger, closer and transverse at the base, smaller and rounder on the declivity, apex of the 2nd interstice a little depressed; elytral pubescence subsquamous, very short and difficult to observe.

Hab. Mysol (Wallace).

Hylesinus despectus, Walk.

I must refer to this Ceylonese species, with which I have previously identified *H. scobipennis,* Chap., four examples taken by Wallace, in Sarawak, Celebes, Batchian, and Dorey in New Guinea, respectively. The specimens show some differences, both in the depth of the thoracic punctuation and the shape of the prothorax, which, in all, except the Batchian example, is somewhat trapezoidal, with a rather distinct muricate

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tubercle at the anterior angles. In the absence of long series, it can only be said that there are no present reasons for doubting the substantial identity of all these forms; the differences in the shape of the prothorax appear to be sexual, the trapezoidal shape existing in the female, although the New Guinea example, apparently a male, as its front is impressed, offers some difficulty towards the acceptance of this supposition.

Phlœosinus cribratus, sp. n.

Fem. (?) Oblongo-obovata, picea, antennis pedibusque rufescentibus; prothorace semiellipticо, subglabro, subnitido, fortiter punctato, linea media subelevata lævi; elytris crenato-striatis, interstitiis transverse rugosis, in declivitate 2°, 4° exceptis, seriato-tuberculatis et brevissime setosis. Long. 2 mm.

Female. (?). Oblong-obovate. Head pitchy-black, the front shining, rather strongly but not rugosely punctured, above convex, with a median tubercle, impressed below and smoother, scantily and shortly hairy, the mouth with a very short yellowish fringe; eyes bipartite, the emargination just reaching the posterior border of the eye; antennæ yellow-testaceous, normal, the club finely and closely pubescent. Prothorax as long as broad, narrowed from the base, the sides and apex rounded in a conjoint ellipse, the basal border bisinuate, forming an obtuse angle in the middle; surface reddish piceous, shining, subglabrous, strongly but not rugosely punctate, the median line smooth, subelevated. Elytra a little wider than the prothorax, and three-fourths longer, their basal margins oblique, narrowly elevated and crenate, the sides sinuate and subampliated behind, the apex broadly rounded; surface piceous, reddish posteriorly, crenate-striate, the striæ deep but not wide, subequal throughout, interstices subconvex, more strongly on the declivity, closely and transversely rugulose, with very short uniseriate squamiform bristles (probably from base to apex in fresh examples), and behind the middle with small uniseriate tubercles, absent towards the apex of the 2nd and 4th interstices, the bristles irregularly biseriate on the apex of the other interstices. Underside and legs rufescent; 3rd tarsal joint simple.

Hab. Sumatra, from tobacco (Grouvelle).

The nearest ally of this species appears to be *P. detersus*, Chap., from Ceylon, which is very much larger, with the prothorax more finely and remotely punctate, the

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interstices less closely rugose, and much more shining. The complete division of the eyes in *P. cribratus* is remarkable, but is not of sufficient importance to indicate generic separation.

Phlœosinus vilis, sp. n.

Oblongo-ovalis, subdepressus, piceus, elytris rufescentibus, prothorace longitudine paullo breviore, antice constricto, apice sat late rotundato, dorso punctato, linea media et plaga in utroque latere lævibus; elytris punctato-striatis, interstitiis rugis transversis et setis brevibus uniseriatim ornatis, in declivitate tuberculatis. Long. 1·5–1·6 mm.

Mas. Fronte impressa.

Oblong oval, somewhat depressed. Head black, rugulose, subnitid, very shortly pubescent; front (♂) with a not sharply-defined circular impression; front (♀) subconvex; eyes narrow, deeply emarginate; antennæ brown-testaceous, the club oval, not elongate. Prothorax rather broader than long, widest at the base and constricted towards the apex, the sides slightly rounded behind and sinuate in front the apex rather broadly and obtusely rounded, the base bisinuate, but scarcely produced backwards in the middle; surface piceous, lighter at apex, moderately shining, subglabrous, strongly punctured, the median line smooth, subelevated throughout, on either side behind the middle is a subelevated impunctate oblong space external to a shallow impression. Scutellum small, rounded, black. Elytra as wide as the prothorax, and fully one-half longer, their basal margins rounded internally, nearly transverse externally, narrowly raised and crenate, the sides parallel, the apex broadly rounded; surface piceous-red, finely punctate-striate, the interstices narrow, subconvex, with uniseriate very short bristles and transverse raised rugæ, weaker at the base, tuberculiform on the declivity (a little more strongly in the male), and absent at the apex of the second interstice, which is smoother and flatter in the male. Underside piceous, moderately strongly punctured; legs brown, the 3rd tarsal joint simple.

Hab. Sumatra, from tobacco (Grouvelle).

I have received, from the same source, four or five specimens of this insect, one of the smallest species of the genus and of the Hylesinides. It is unusual in the genus to meet with so little sexual difference in the structure of the elytral apex.

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Cryptarthrum, g. n.

Cryphalo affine, discedens prothoracis basi et angulis posticis marginatis, dorso haud evidenter asperato: tarsorum articulo 1° minuto, 2° majore, compresso, 3° parvo.

Head concealed, not rostrate. Eyes oval, emarginate. Antennæ with very short 4-jointed funiculus, the three distal joints transverse, widened apically, club ovate, compressed, the sutures curved on the inner, straight on the outer face, and ciliate. Prothorax short, much narrowed in front and obtusely subacuminate at apex, the hind-angles and base finely margined, surface without evident asperities. Elytra not overlapping the prothorax at base. Anterior coxæ contiguous, the prosternal process short. Anterior tibiæ widened from base to apex, and obliquely truncate, the upper margin sinuate, obsoletely toothed; middle and posterior tibiæ with the upper margin rounded, serrate. Tarsi short, the 1st joint very small, the 2nd rather large, compressed and trigonate, the 3rd small, the apical joint not so long as the preceding.

The single species more nearly resembles a *Cryphalus* than the species of any other genus. The available examples were too few to permit of dissection, and the examination of the tarsal joints proved unexpectedly difficult, as the underside and legs were matted together with some adhesive substance, probably derived from the food-plant.

Cryptarthrum walkeri, sp. n.

Breviter oblongo-ovale, opacum, pallide fusco-testaceum, pilis brevibus flavo-cinereis vestitum, antennis et pedibus testaceo-ferrugineis; prothorace alutaceo-ruguloso, anterius obsolete granulate; elytris dense multipunctatis et seriatim setosis. Long. 1·4–1·6 mm.

Short oblong-oval, pale fusco-testaceous, dull, with short moderately close cinereous-yellow pubescence mingled with longer setæ. Front darker, impressed, rugulose, thinly hairy; antennæ pale ferruginous. Prothorax a half broader than long, subbisinuate and finely margined at the base, the margin continued along the subacute hind-angles to the middle of the sides, the latter rounded throughout, strongly incurved and constricted anteriorly, so that the apex appears obtusely angulate in the middle; surface uniformly and not strongly convex from base to apex, alutaceous,

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with close rugulose punctuation, and towards the apex with minute scattered granules, the anterior margin crenate, pubescence decumbent except for the scattered setæ, and partly concealing the sculpture. Scutellum scarcely distinguishable. Elytra closely applied at base to the prothorax, as wide and about a third longer, the sides gently rounded towards the base, more strongly behind, apex rounded; surface slightly rounded to the middle, thence more convex and declivous, with very close fine subrugulose punctures, bearing short decumbent and sometimes squamiform hairs, the punctures of the striæ not separable from those of the interstices, and with regular uniseriate erect setæ. Underside more deeply infuscate, pubescent. Legs ferruginous.

Hab. Damma I. (J. J. Walker).

Two examples. The British Museum Collection presumably contains others, as it received the first series of Mr. Walker's captures. Mr. Walker informs me that the insect was found probably in a species of *Urostigma* (a genus allied to *Ficus*); this would account for the glutinous material which entangled the undersides of the specimens.

Tomicus perexiguus, sp. n.

Elongatus, cylindricus, testaceus, rarissime pilosus; antennarum clava transverse suborbiculata, suturis subrectis; prothorace oblongo, lateribus parallelis, apice rotundato, disco post medium sat distincte punctato; elytris lineato-punctatis, punctis ad basin obsoletis, ad apicem profundis dilatatis, interstitiis subimpunctatis, apice subverticaliter retuso vel excavato, fundo subcirculari, punctato, infra marginato, supra utrinque bidentato.

Mas. Apice elytrorum excavato, infra elevato-marginato, superne valide dentato. Long. 1·9 mm.

Fem. Apice modo retuso-impresso, margine inferiore parum elevato, dentibus ad tuberculos minutos reductis. Long. 1·6 mm.

Elongate, narrow, cylindrical, testaceous, moderately shining, scantily and finely pilose. Front slightly convex, closely and rugosely punctate over the mouth, subnitid towards vertex (at least in ♀), glabrous, mouth fringed with a few short hairs; eyes large, broad oval, little emarginate, coarsely granulate;

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antennæ testaceous yellow, the club suborbicular, broader than long, with transverse sutures, the basal joint ample, occupying more than half the surface, corneous on both faces. Prothorax oblong, parallel-sided behind the middle, slightly narrowed in front, broadly and strongly rounded at the apex, hind-angles rounded, the base subbisinuate; surface feebly elevated before the middle, in front obliquely and not strongly declivous, asperate with fine imbricate rugæ, stronger in the male, and with a few fine erect hairs towards the apex, behind cylindrical, slightly impressed on either side about the middle, moderately shining, with fine but evident punctuation, absent over the middle line and a spot on either side, interspaces (♂) smooth, (♀) finely reticulate. Scutellum triangular, shining, infuscate. Elytra about as wide as the prothorax and rather more than a third longer, truncate at base, with subrectangular shoulders and parallel sides; surface cylindrical, lineato-punctate, the punctures very minute at the base, gradually becoming large and deep towards the declivity, interstices flat, shining, remotely and microscopically punctate in single rows, thinly hairy towards the apex, the 2nd and 4th subelevated behind and furnished each on the margin of the declivity with a strong acute tooth (♂), a small pointed tubercle (♀); apex (♂) not narrowed, subcircularly excavate, the excavation limited to the posterior fourth, its fundus concave, shining, very strongly punctured, with a raised crenate lateral and inferior margin; apex (♀) narrowed, retuse, with a deeply punctured impression on each side of the suture, wider below, the sides above callose and bearing the two tubercles, inferior margin well-defined but little raised. Underside concolorous, very scantily pubescent; prosternum with a distinct antecoxal process; tibiæ very slender and weakly-spined.

Hab. Damma I. (J. J. Walker).

Two specimens. Widely separated as this species is by its minute size from the other members of the genus, it appears in every respect to be a true *Tomicus*, and the male is not unlike an extremely small and elongate *T. erosus*, Woll. Though the genus *Pityogenes*, Bedel, differs from *Tomicus* in characters dependent merely on degradation and small size, this species cannot well be referred to it. It has a most distinct prosternal process, and its elytral structure is that of the *Onthotomicus* group.

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Dryocœtes taprobanus, sp. n.

Oblongus, niger, nigro-piceus vel ferrugineus, subnitidus, longius pilosus; prothorace subovato, per totum, postice rarius, granulato; elytris subtiliter lineato-punctatis, interstitiis uniseriatim setosis, apice fortiter declivi, subdeplanato. Long. 3–3·8 mm.

Oblong, varying in colour from deep ferruginous to black, usually black with the elytra piceous, with rather long fine erect fulvous pubescence. Front subconvex, impressed over the mouth, dull, closely asciculate below, punctate above, towards the vertex with a median shining elevation, pubescence moderately thick; eyes oblong, with a rather shallow emargination; antennæ ferruginous, the club as in *D. autographus*. Prothorax a little longer than broad, forming an incomplete oval, widest about the hinder third, the sides behind little rounded, and very slightly constricted in front, base truncate, hind-angles obtuse but not rounded, somewhat distinctly margined above the pleural impression; surface regularly convex from base to apex, pilose with erect hairs and asperate with elevated granules, weaker behind and replaced along the hind-margin by punctures, median line smooth, subelevated, extending to the middle. Scutellum rounded trigonate, smooth, shining. Elytra wider than the prothorax at its base and about a half longer, exactly truncate at the base, with subrectangular shoulders, the sides subparallel to the hinder third, thence obliquely incurved; surface subcylindrical to about the middle, or somewhat pulvinate, thence obliquely declivous, and convex above, finely lineato-punctate, the punctures shallow, weaker at the sides, the two first striæ subimpressed, the sutural the more distinctly, interstices nearly flat, the inner pair very feebly convex, subnitid, with regular single series of erect hairs arising from minute elevated points; declivity flattened from side to side and weakly impressed on each side of the suture, obsoletely lineato-punctate, the interstitial hairs a little longer. Underside piceous, thinly pilose; legs ferruginous, the tibiæ stout, dilated towards the apex, and rather strongly serrate.

Hab. Ceylon (Thwaites: in Mus. Oxon.).

The Hope Collection possesses a good series of the species, which in size nearly equals *X. autographus*. No well-marked sexual differences appear to be present.

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The three following species of *Dryocœtes* show certain divergences from the common type of the genus in the shape of the prothorax, which is less elongate than usual, being in two of the species nearly semielliptical, and tends to become gibbous near the base. This form of prothorax, which approaches that of *Xyleborus*, is not associated with other marked differences; the mentum is rather more oblong than usual, and the first joint of the labial palpi is very large and tumid, as in *Xyleborus*, the second and third being quite minute; the maxillary armature, as is customary in *Dryocœtes*, is spinous and not setose. This latter point appears decisive as to placing the species in the present genus rather than in *Xyleborus*, with which they appear to form an osculant group. It would be premature to establish a fresh genus for them without undertaking a revisional examination of the mental structure in other species of *Dryocœtes*.

Dryocœtes rugatus, sp. n.

Oblongus, niger, parum nitidus, fusco-pilosus, antennis pedibusque ferrugineis; prothorace vix æque longo quam lato, lateribus et apice conjunctim semielliptice rotundatis, dorso subæqualiter rugoso-asperato; elytris striato-punctatis, interstitiis rugosis, et punctis piliferis confertis uni-vel biseriatim munitis, apice fortiter oblique declivi, retuso, rugoso-punctato. Long. 5 mm.

Oblong, black, little shining, with fine fuscous-yellow pubescence, the legs and antennæ deep ferruginous. Head shortly subrostrate, the front slightly convex, subnitid, closely and rugosely punctured, feebly impressed between the eyes, finely carinate over the mouth, pubescence not dense, rather long, the mouth fringed; eyes narrow oblong, flat, anteriorly sinuate; antennal club normal. Prothorax scarcely as long as broad, widest before the base, the sides and apex conjointly rounded and a little exceeding a half-ellipse, the hind-angles obtuse, the base subtruncate; surface convex from side to side, declivous but not strongly convex from the basal limb to the apex, pilose with uniformly scattered hairs, short over the disc, longer at the sides and apex, and covered with close small imbricate asperities, rather weaker behind, the median line smoother and subelevated from the base to the middle, but very indistinct. Scutellum rounded triangular, shining. Elytra truncate at the base, a little wider than the prothorax and not quite double as long,

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the shoulders rounded rectangular, the sides subparallel, narrowed and incurved behind, the apical margins oblique ; surface cylindrical to the hinder third, thence strongly declivous and subretuse, punctured in scarcely impressed rows, the sutural row not deeper, the punctures rather large but not conspicuous, owing to the transverse rugæ extending between them on to the interstices, the latter scarcely convex, with close piliferous punctures or punctiform elevations, in single series, except on the 3rd and 5th interstices, where they are irregularly biseriate, the hairs fine and short, longer at the side-margins ; declivity somewhat flattened, impressed along the 2nd interstice, dull, rugosely punctured, not more strongly hairy, or tuberculate. Underside black ; tibiæ strongly serrate.

Hab. Borneo, Sarawak (Wallace).

The rugosity of the elytra is a characteristic feature, and one which renders the details of the sculpture hard to examine. The head is slightly but still perceptibly prolonged in front, although the entire absence of any rostrum is supposed to be one of the distinguishing features of this and allied genera.

Dryocœtus sumatranus, sp. n.

Oblongus, badius, subnitidus, erecte fulvo-setosus ; prothorace longitudine subbreviore, fere semiellipticó, anterius tamen subconstricto, dorso ante basin transverse gibbo, per totum aspero, granulis in parte postica subtilioribus ; elytris punctis magnis striatis, interstitiis transverse rugulosis alternatim uni- vel irregulariter biseriatim setosis, declivitate obliqua, subretusa, interstitiis convexioribus, 2° impresso. Long. 5·7 mm.

Oblong, not very shining, testaceous-brown, pilose with rather strong erect fulvous hairs. Head large, the front oblong, subconvex, closely and rather strongly punctured, subrugose, with scanty long pubescence ; eyes oblong-oval, sinuate in front ; antennæ yellow-testaceous, normal, outer face of the club spongy apically, with nearly straight sutures. Prothorax rather broader than long, widest just before the base, the sides and apex conjointly rounded, save for a slight constriction about the anterior third, hind-angles subrectangular, the base truncate; surface gibbous and elevated into an obtuse transverse nodus at the hinder fourth, anteriorly convex, posteriorly declivous from the nodus to the base, thinly pilose, asperate with close imbricate rugæ, finer posteriorly, and granular, especially towards the middle of the base. Scutellum triangular

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moderately shining. Elytra truncate at the base, rather wider than the prothorax and twice as long, with rectangular shoulders, the sides parallel, and not narrowed behind, broadly rounded at the apex; surface cylindrical to beyond the hinder third, and impressed along the suture, thence subabruptly declivous, with substriate rows of large round punctures, separated by transverse elevated rugæ continued across the interstices, the latter slightly convex, moderately shining, with erect hairs, uniseriate on the 2nd and succeeding alternate interstices, irregularly biseriate on the others; declivity oblique, subretuse and flattened, the striæ less strongly punctured, appearing deeper on account of the greater convexity of the interstices, the sutural interstice being more and the second less elevated, the hairs arising from elevated points. Underside and legs testaceous; the tibiæ strongly dentate, the anterior pair subtruncate at apex, the other pairs rounded.

Hab. Sumatra, Singalang Mts. (Beccari).

My single specimen has an impression along the suture from near the base to the summit of the declivity, which is rather more rugose; but this is perhaps an individual feature. The sutural stria is not deeper than the rest.

Dryocœtes gravidus, sp. n.

Oblongo-obovatus, subnitidus, fusco-brunneus, breviter pilosus; prothorace fere semielliptico, dorso post medium gibbo, toto granulato, linea media basali lævi; elytris sat subtiliter lineato-punctis, interstitiis planis æqualiter irregulariter punctatis, apice fortiter declivi, juxta suturam subimpresso, interstitio 3° subconvexo. Long. 4·8 mm.

Oblong, widened from the front of the thorax to the hinder third of the elytra, fuscous-brown, the antennæ and legs brown-testaceous, with short fine fuscous pubescence. Front oblong, scarcely convex, shining, obsoletely punctate, thinly pilose with long hairs, above mouth with a fine sharp carina; eyes broad, oblong-oval, anteriorly emarginate. Prothorax broader than long, the sides rounded and rather sharply narrowed from before the base to the apex, the latter more broadly rounded, hind-angles obtuse, base truncate; surface gibbous just before the base, the elevation not markedly transverse, and, together with the apex, of darker colour, thinly pilose, the marginal hairs longer, and granulate, the granules weaker along the basal limb, which has an ill-defined median smooth line extending to the summit of the elevation.

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Scutellum rounded triangular, shining. Elytra wider than the prothorax, and nearly twice as long, truncate at base, the humeral angles rounded, the sides straight and divergent to the hinder third, then broadly incurved to the apex, the margins of the latter somewhat oblique and not conjointly rounded; surface subnitid, cylindrico-convex to behind the middle, thence declivous, darker posteriorly, lineato-punctate, the punctures moderately fine and not easily distinguishable from those of the almost flat interstices, which are punctured irregularly in alternate single and double rows; apex less flattened than in the preceding species, strongly declivous, slightly impressed on each side of the suture, obsoletely punctured, the interstices feebly convex, with minute piliferous points. Underside concolorous, tibiæ strongly serrate.

Hab. Borneo, Sarawak (Wallace).

Both my specimens have lost the antennal clubs; those of one example disappeared in process of cleaning, but not before I had been able to observe that they were of *Dryocœtes*-like character. The shape of the prothorax is similar to that of *D. sumatranus*, but the species is rather more depressed, widened behind, with the hairs much finer and the punctures on the elytra fine and ill-marked, so that the surface appears at first sight to be tolerably closely and confusedly punctate.

Xyleborus colossus, sp. n.

Fem. Oblonga, cylindrica, nigro-picea, prothoracis antica parte et elytrorum basi dilutioribus; prothorace transverso, lateribus et apice conjunctim rotundatis, angulis posticis postice productis, apice medio prominulo, dorso post medium transverso elevato, postice subopaco, subtiliter granulato; elytris indistincte lineato-punctatis, interstitiis multipunctatis, apice oblique excavato-retuso, retusione per totum elevato-marginata, superne prorsus producta, longitudinaliter convexa, striato-punctata, interstitio 2° seriato-tuberculato. Long. 8·5 mm., lat. 4·5 mm.

Female. Oblong, cylindrical. Head piceous, front subconvex, irregularly and subobsoletely punctate, scantily pubescent, epistoma with a median patch of thick cilia; eyes large, oblong, emarginate, coarsely granulate; antennæ ferruginous, the club large, of normal structure. Prothorax transverse, widest just before the base, the sides and apex conjointly rounded, the former but slightly behind the middle, margin of the latter prominent, everted and crenate in the middle, hind-angles produced backwards, the base bisinuate;

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surface piceous-black behind, piceous-red in front, with long fulvous pubescence round the margins, transversely elevated behind the middle, the anterior half convex, asperate with elevated transverse rugæ, smaller and closer posteriorly, their interspaces with minute granules, posterior part declivous from the elevation to the base, subopaque, with fine granules, not close, and obsolete on the hind-margin, the median line fine, shining, raised and extending to the elevation. Scutellum small, subtriangular, piceous-black. Elytra scarcely as wide at base as the prothorax, and one-half longer, their basal margins slightly curved, the shoulders rounded, the sides straight and subdivergent, the apical margin subtruncate when seen from above; surface cylindrical, obliquely retuse at apex, piceous, lighter towards the base, tolerably shining, remotely lineato-punctate, the interstices quite flat, finely multipunctate, their punctures bearing fine fulvous hairs, and subrugose towards the apex, all the punctuation feeble at the base, and becoming stronger posteriorly; apical retuse surface beginning at the basal third, its margins meeting at an acute angle above, and circularly rounded below, prominent but not acute, their upper third subtuberculate; fundus depressed below the margins, convex from before backwards, subnitid, pubescent with decumbent yellowish hairs, striato-punctate with shallow large punctures, 2nd interstice elevated and callose, 5-tuberculate, the three superior tubercles strong, conical. Underside piceous; legs deep ferruginous, the tibiæ very broad, strongly rounded and finely serrate on the upper margin; tarsal claws toothed at the base.

Hab. New Guinea, Humboldt Bay (Doherty).

This species, of which I have seen no second example, is by far the largest of the genus, and in bulk of all the Tomicidæ yet known, though it is exceeded slightly in length by one or two species of *Amphicranus*, and perhaps by exceptionally large individuals of some species of *Tomicus*.

Xyleborus globus, sp. n.

Fem. Curta, subovalis, convexa, subnitida, nigra, longe fusco-pilosa, pedibus testaceis; prothorace transverso, lateribus postice subrectis, antice cum apice conjunctim rotundatis, margine apicali medio bituberculato, dorso postice subasperate punctulato et in margine medio dense hirto; elytris semiovalibus a basi ipsa convexe declivibus, confuse punctatis, post medium perindistincte striatis. Long 5 mm.

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FEMALE. Short, convex, black, slightly shining, with long fuscous pubescence. Front subconvex, with not very close piliferous granules, and a median smooth space, epistoma thickly fringed with yellow cilia; eyes small, emarginate; antennæ ferruginous, with infuscate club. Prothorax transverse, subbisinuate at base, the hind-angles subobtuse, the sides feebly rounded to before the middle, thence broadly rounded with the apex, of which the margin is prominent and bituberculate in the middle; surface very convex, with a small median transverse elevation, in front declivous, asperate, with small granules in the interspaces, behind cylindric, subnitid, with fine and mostly subasperate punctures, the median line indistinct, pubescence long, dense round the margins, the middle of the basal border with a thick fringe of erect hairs. Scutellum absent. Elytra about as wide as the prothorax and scarcely longer, truncate at base, the humeral angles obtuse, the sides elliptically rounded to the apex; surface declivous and very convex from the base, behind the shoulders with an indistinct callus indicating the junction of the declivity with the horizontal portion, which persists at the sides only, irregularly and finely punctate, the punctures subasperate and bearing long hairs, the sutural stria and part of the lateral striæ just traceable, particularly towards the apex, which has a raised inferior margin. Legs testaceous, tibiæ broad and finely serrate.

Hab. New Guinea, Dorey (Wallace).

In this species the encroachment of the declivous retuse surface so often found in *Xyleborus* on to the horizontal portion of the elytra is carried to its very furthest limits, the latter being practically nonexistent. Described from one example; there is another in the British Museum Collection.

Xyleborus papuanus, sp. n.

FEM. Oblonga, cylindrica, nigro-picea, antennis pedibusque ferrugineis, subnitida, brevissime sparsim pilosa; prothorace subgloboso, disco medio transverse elevato, postice sat conferte punctato; elytris dense irregulariter punctatis, apice retuse declivi, impresso, immarginato, subtiliter lineato-punctato. Long. 3 mm.

FEMALE. Oblong, cylindrical, rather dull, pitchy-black, with scanty and extremely short greyish pubescence, antennæ and legs ferruginous. Front subconvex, strongly punctate, with an indistinct subelevated median line; eyes moderately large, deeply emarginate. Prothorax broader than long, nearly globose, the

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sides very slightly rounded behind, strongly rounded in front conjointly with the apex, hind-angles rectangular, scarcely rounded, base truncate ; surface with a median transverse elevation, convex and declivous anteriorly with rather fine granular asperation, posteriorly cylindric, rather strongly punctured, the punctures deeper and subasperate at the sides, finer towards the middle, the median line obsolete, the interspaces not very shining. Scutellum rounded, black, subopaque. Elytra scarcely as wide as the prothorax and one-half longer, truncate at base, the shoulders rounded subrectangular, the sides subparallel, very slightly convergent behind and strongly incurved at apex, the hind margin obtusely rounded ; surface cylindric, subnitid, closely and strongly punctured, the punctures of the striæ and interstices indistinguishable before the middle, apical third strongly but gradually declivous and subretuse, not margined, subcircularly and weakly impressed, subopaque, finely lineato-punctate, the interstices with rows of very fine short hairs springing from minute subasperate points, and distinguishable before the summit of the declivity. Underside piceous, very shortly pubescent.

Hab. New Guinea (Wallace).

One example; easily distinguished by its confusedly punctate elytra, subretuse at the apex, and unarmed.

Xyleborus semirudis, sp. n.

Fem. Oblonga, subcylindrica, ferruginea, parce tenuiter pilosa ; prothorace transverso, apice rotundato, disco medio transverse elevato, posterius sat nitido, sublævi ; elytris punctato-striatis ante medium nitidis, post medium opacis, convexe declivibus, interstitiis uniseriato-granulatis, declivitate infra marginata. Long. 3 mm.

Female. Oblong, subcylindrical, bright ferruginous, finely and very scantily pubescent. Frontal surface slightly flattened, somewhat irregular, scantily punctured at the sides, smooth and elevated in the middle ; eyes small, deeply emarginate. Prothorax broader than long, the sides scarcely rounded behind the middle, gradually more strongly rounded and incurved in front, the apex broadly rounded, hind-angles rectangular, the base transverse ; surface with a transverse median elevation, in front convex, and asperate with imbricate rugæ, which become weak and very close on the elevation, behind cylindric and subdeclivous to the base moderately shining, with minute close reticulation and scattered

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punctures. Scutellum obtuse triangular, shining. Elytra as wide as the prothorax and less than a half longer, truncate at base, the shoulders nearly rectangular, the sides subparallel to near the apex, then strongly incurved; surface pulvinate and convex from the base, obliquely declivous and somewhat less convex behind the middle, the basal half not deeply punctate-striate, the punctures shallow and rather large, the sutural stria not impressed, interstices flat, shining, subimpunctate, the sutural interstice with a few small granules; apical half opaque, less distinctly striate, the interstices with a single series of rather remote small elevated points; declivity acutely carinate below, the carina not crenate. Underside and legs testaceous.

Hab. Borneo (Wallace).

Allied to *X. semiopacus*, Eichh., but differentiated from it and the following species by the distinct striæ and subimpunctate interstices of the basal half of the elytra. The prothorax is rather obtuse at the apex, and thus approximates somewhat in shape to that of *X. validus*, Eichh. One example.

Xyleborus semigranosus, sp. n.

Fem. Oblonga, subnitida, rufo-ferruginea, prothorace æque longo quam lato, lateribus leniter, apice fortius rotundato, disco obtuse transverse gibbo, post medium subtiliter punctato; elytris prothorace vix tertia parte longioribus, ante medium subtiliter quasi confuse punctatis, post medium convexe declivibus, opacis, granulatis et erecte seriato-pilosis. Long. 2·4 mm.

Female. Oblong, slightly shining, ferruginous-red, rather darker posteriorly. Front subconvex, subnitid, rather strongly punctured, thinly hairy, the mouth fringed with pale hairs; eyes oval, emarginate, tolerably large; antennæ pale testaceous. Prothorax as long as broad, strongly rounded at the apex, the sides very slightly curved and subparallel from the middle to the base, hind-angles obtuse but not rounded, the base truncate; surface with a very slight median transverse elevation, scantily but uniformly pubescent with fine hairs, in front convexly declivous, with granular asperities, somewhat irregular and scattered towards the apical margin, behind the middle cylindrico-convex, subnitid, finely but evidently punctured, the punctures stronger over the middle portion, median smooth line absent. Scutellum triangular,

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infuscate, shining. Elytra as wide as the prothorax and about a third longer, with truncate base, and rounded rectangular shoulders, the sides parallel, abruptly inflexed at apex, the apical margins sharply bordered below and forming an obtuse angle with each other when seen from above ; surface pulvinate-convex from base to apex, before the middle subnitid, very finely and apparently confusedly punctate, the seriate and interstitial punctures being similar ; declivity beginning before the middle, somewhat depressed, opaque, without evident striation, very closely and finely granulate, and set with single series of rather long upstanding hairs. Underside rather darker ; legs brown-testaceous, the tibiæ rounded above and finely serrate.

Hab. Sumatra, from tobacco (Grouvelle).

A near ally of *X. semiopacus*, Eichh., which it closely resembles in colour and sculpture. It is a rather smaller insect, and is best distinguished by the much shorter elytra, which are barely one-third longer than the prothorax, and present, when viewed from the side, a uniform dorsal curvature from base to tip ; in *X. semiopacus* the elytra are rather more than a half longer than the prothorax, and are nearly cylindrical to behind the middle, and not uniformly curved from base to apex. In *X. semigranosus* the prothorax is longer in proportion to its width, and is less ample before the middle ; the elytral punctuation is finer and the traces of the striæ are even more indistinct than in its congener. My type has a short impressed line on the base of the prothorax anterior to the scutellum, but this may be an individual characteristic.

Xyleborus fraternus, sp. n.

Fem. Oblonga, picea, pedibus antennisque pallide testaceis, parce pilosa ; prothorace late semi-elliptico, lateribus postice leniter rotundatis, dorso gibbo, posterius sublævi ; elytris striato-punctatis, interstitiis uniseriatim setosis, in declivitate obliqua, infra acute marginata, seriato-tuberculatis. Long. 2·7 mm.

Female. Oblong, piceous (perhaps black when mature), moderately shining, scantily hairy, the antennæ and legs pale testaceous-yellow. Head subconvex in front, rather sparsely and strongly punctured, with a supraoral shining median elevated space, hairs

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scanty; eyes oval, emarginate. Prothorax a little broader than long, widest at the base, the sides rounded in a gradually-increasing curve from the base to the apex, the apical margin broadly rounded and crenate, hind-angles slightly obtuse, the base subtruncate; surface convex, with an obtuse post-median transverse gibbosity, strongly declivous in front, and asperate with imbricate rugæ, behind subnitid, obsoletely punctured, obliquely impressed within the hind-angles. Elytra as wide as the prothorax and scarcely a half longer, with subrectangular shoulders, parallel-sided to the middle, slightly narrowed behind, broadly rounded and sharply margined at apex; surface convex from base to apex, punctured in subimpressed rows, interstices transversely rugulose, with seriate hairs from the base to the apex, arising from small points, elevated and tuberculiform on the posterior declivous portion.

Hab. Ceylon (G. Lewis).

Intimately allied to *X. fornicatus*, from which at first I was unable to separate it. Having now seen both the type and a long series of the latter species, I am able to distinguish between them. The present species is rather larger and broader than its ally, with the elytra relatively rather shorter; the prothorax is widest at the base, and the sides quite regularly rounded to the apex, while in *X. fornicatus* the thorax is as wide at the anterior third as at the base, and the sides are more parallel. *X. xanthopus*, another allied species, has the elytra relatively longer than those of *X. fornicatus*, and the prothorax more nearly orbicular.

Xyleborus fornicatus.

X. fornicatus, ♀, Eichh., Berl. ent. Zeitschr., 1868, p. 151; Rat. Tom., p. 327.

Mas. Minutus, oblongus, testaceus vel piceo-fuscus, longius parce pilosus; prothorace transverse quadrato, antice rarius granulato; elytris ab antica tertia parte obliquissime declivibus, striato-punctatis, interstitiis seriato-setosis. Long. 1·4 mm.

Male. Very small, oblong, rather shining, varying from pallid testaceous to pitchy-fuscous, with long sparse erect setæ. Front somewhat flattened, with an indistinct longitudinal elevation, shining, obsoletely punctate, scantily hairy; eyes small, narrow

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Prothorax much broader than long, subrectangular, the sides subparallel, the apex very obtusely rounded, hind-angles subrectangular, the base transverse ; surface strongly convex from base to apex, somewhat flattened in front from side to side, the apical half with very scattered granules, weaker behind, the basal half finely reticulate, feebly punctured at the sides only. Elytra as wide as and nearly a half longer than the prothorax, with gently curved sides, narrowed behind and broadly rounded at the apex ; surface pulvinate, obliquely declivous and somewhat flattened from the anterior third, at the base lineato-punctate, with scattered piliferous punctures on the interstices ; declivity weakly striate, the interstices subconvex, with elevated piliferous points. Antennæ and legs light testaceous.

Hab. Ceylon.

I have received a fair series of this species, partly from the Indian Museum, Calcutta, partly from Mr. E. Ernest Green, and have been able to compare the female with Eichhoff's type. The insect has lately made itself conspicuous in Ceylon as a destroyer of the tea-plant. Some twigs accompanying the specimens are about a quarter of an inch in diameter, and show several ramifying burrows, similar to those made by *X. dispar*, without any very special features. The diameter of the holes, an important point in diagnosis of these injuries, is about 1·1–1·2 mm.

Xyleborus pruinosus, sp. n.

Fem. Oblonga, cylindrica, subopaca, ferrugineo-picea, capite et prothoracis apice ferrugineis, opaca, pube brevi appressa sat dense pruinosa ; capite magno, fronte convexa, rudi, punctata, linea media carinata; prothorace suboblongo, lateribus vix, apice fortiter rotundato, dorso haud evidenter umbonato, postice subtilissime punctulato ; elytris quasi confuse punctatis et granulis minutis elevatis posterius magis distinctis aspersis, apice convexe declivi. Long. 4 mm.

Female. Oblong, cylindrical, rather dull, entirely covered with very short fine appressed hairs. Head large, obscure ferruginous, dull, convex in front, rugulosely punctured, with a fine sharp median carina not reaching the mouth, epistoma thickly fringed ; eyes small, deeply emarginate ; antennæ fusco-ferruginous. Prothorax a little longer than broad, broadly rounded and subbisinuate

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in front, the apical margin crenate and everted but not projecting, the sides scarcely rounded behind the middle, hind-angles subobtuse but not rounded, the base transverse; surface cylindrical behind the middle, declivous and convex in front but with no evident gibbosity at the junction, reddish-pitchy, lighter anteriorly, uniformly pubescent, with a few erect hairs round the margins, the anterior half asperate with small scattered transverse rugæ, intermixed with granules, the posterior half very finely and rather closely punctured, with no evident median line. Scutellum rounded, subconvex, shining, black. Elytra scarcely as wide as the prothorax and less than a half longer, truncate at base, the shoulders rounded, the sides subparallel, rounded and inflexed behind the middle, the apical margins oblique and not conjointly rounded; surface convex from base to apex, rather strongly declivous behind the middle, piceous, with short appressed cinereous hairs, closely punctured and except over the basal third covered with scattered granules (with microscopic examination only, the punctures of the true striæ can just be differentiated from those of the interstices); declivity not acutely margined below, convex, very faintly striate. Underside piceo-ferruginous, pubescent; legs brown-testaceous, all the tibiæ rounded and finely serrate above.

Hab. Borneo, Sarawak (Wallace).

Evidently related to *X. pelliculosus*, Eichh., and like that insect, with the prothorax of the type of his Division III. *X. pruinosus* is a much larger and stouter insect, differently proportioned, with the elytra pulvinate, more strongly punctate as well as granulate, and not impressed at apex.

Xyleborus puberulus, sp. n.

Fem. Oblonga, cylindrica, fusco-picea, subopaca, pube brevi vestita; fronte haud carinata; prothorace manifeste oblongo, apice rotundato, lateribus postice rectis, dorso antice dilutiore, postice subtiliter punctulato; elytris prothorace vix longioribus, indistinctissime striatis, interstitiis mox pone basin granulis elevatis sine ordine instructis, apice fortiter declivi, haud impresso. Long. 2·3 mm.

Female. Oblong, cylindrical, dull, clothed with short rather dense pubescence, relatively longer than in *X. pruinosus*. Head pitchy, front subconvex, dull, shortly hairy, not evidently punctate, not carinate; eyes moderate, deeply emarginate; antennæ testa-

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ceous. Prothorax manifestly oblong, strongly rounded behind, parallel-sided from before the middle to the base, the latter truncate, the hind-angles rounded, anterior opening bisinuate ; surface with a very indistinct ante-median transverse elevation, in front convex, declivous, fusco-ferruginous, finely granulate-asperate, behind cylindric, subopaque, alutaceous, feebly and scantily punctured. Scutellum large, rounded oblong, black, subrugulose. Elytra as wide as but scarcely longer than the prothorax, parallel-sided, the apical margins oblique, and scarcely conjointly rounded ; surface cylindric, strongly declivous for the hinder fourth, fusco-piceous, the base and apex obscure reddish, pilose and very faintly striate, the punctures of the striæ visible at the base in the substance, the interstices at the base subnitid, rugulose and multipunctate, thence covered with elevated granules and quite opaque ; declivity subconvex, not impressed, dull, not sharply margined beneath. Underside concolorous, pubescent, legs brown-testaceous.

Hab. Borneo, Sarawak (Wallace).

A very much smaller insect than *X. pruinosus*, with the elytra only about as long as the more elongate prothorax, and much rougher with elevated granules.

Xyleborus scabripennis, sp. n.

Fem. Oblonga, cylindrica, subopaca, nigra, capite, prothoracis apice, elytrorum declivitate obscure rufescentibus, pedibus fusco-testaceis, breviter pilosa ; prothorace latitudine longiore, apice rotundato, disco haud umbonato, antice convexo, postice cylindrico, ad basin obscure nitido, sublævi ; elytris brevibus, subsulcatis, interstitiis ad basin subnitidis, ad medium grosse granulato-tuberculatis, declivitate obliqua, retusa, dense subtiliter seriato-granulata et breviter pilosa. Long. 2·3 mm.

Female. Oblong, rather short, cylindrical. Head large, deep fuscous, the front black, convex, with short hairs arising from small asperate granules, and with a fine median carina, mouth fringed ; eyes not large, oblong, deeply emarginate ; antennæ brown-testaceous, the funiculus short, the club orbicular, normal. Prothorax a little longer than broad, the sides and apex rounded, the former very slightly behind the anterior third, the hind-angles rounded, the base truncate ; surface declivous before the middle, cylindrical behind, with no evident median nodus, black, the apex rufescent, very finely and shortly pilose, in front with small granular asperities, fine and rugulose over the median third, the

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basal portion obscurely shining, closely reticulate, obsoletely punctate. Scutellum large, rounded triangular, black, rugose. Elytra about as wide as the prothorax, and only one-fifth longer, truncate at base, with subrectangular shoulders, the sides parallel, abruptly inflexed behind, the apical margins obtuse and scarcely conjointly rounded when seen from above; surface cylindrical for a little more than the anterior half, then strongly but obliquely declivous and subretuse, black, the declivity obscurely reddish, above subsulcate, the sulci obliterated at the base, evident towards the declivity, interstices subnitid at the base, finely multipunctate, then uniseriate-tuberculate and shortly pilose, the tubercles close, the four or five preceding the declivity being strong, erect, and spinous; the latter slightly convex, dull, closely but more finely seriato-granulate, the rows of granules separated by sulci, and pilose with short hairs, not sharply margined below. Underside piceous, thinly hairy, the abdomen with strong rugose punctuation; legs brown-testaceous, the tibiæ slender, curved, and finely serrate above.

Hab. Borneo, Sarawak (Wallace); Sumatra, from tobacco (Grouvelle).

The shape of the prothorax differs a little in my two examples, being more uniformly curved from base to apex in that from Borneo, whereas the Sumatra specimen has a slight apical constriction. The species, though quite peculiar in sculpture for a *Xyleborus*, and somewhat suggesting a *Hylocurus*, is normal in generic characters, and is related to *X. puberulus*, of which the elytral sculpture is destitute of the coarse tubercles margining the declivity in the present species.

Xyleborus arcticollis, sp. n.

Mas. Elongatus, subnitidus, tenuiter erecte pilosus, fusco-ferrugineus; prothorace valde elongato, post medium constricto, apice utrinque rotundato, medio leniter emarginato, dorso depresso ad apicem convexe declivi, antice granulato-asperato, postice subtiliter punctato; elytris prothorace subbrevioribus, subtiliter confuse punctatis et pilosis, apice convexe declivi obsolete striato. Long. 4·8 mm.

Male. Elongate, slightly shining, fusco-ferruginous, thinly covered with fine erect hairs. Front convex and subpulvinate over the mouth, closely rugose, carinate along the middle, thinly hairy, impressed on the middle of the fringed epistoma, above with

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an arcuate impression below the vertex, rather closely punctured, and with the carina replaced by a non-elevated smooth line; vertex opaque, impunctate; eyes small, emarginate; mandibles very prominent; antennæ brown-testaceous, normal. Prothorax fully one-half longer than wide, constricted behind the middle, thence ampliated, and widest behind the apex, the anterior angles broadly rounded with the outer parts of the apical margin, which is almost bilobed, being separately rounded on either side with a very shallow median indentation, hind-angles broadly rounded, the base truncate in the middle; surface moderately convex from side to side, depressed longitudinally and (in side view) appearing flat from just before the base to the anterior fourth, where it becomes declivous and convex, apical margin tuberculate, the anterior half asperate with rather coarse granules, and pilose with fine erect hairs, posterior half moderately shining, more thinly hairy, weakly punctured, the punctures closer in front than at the base, which is somewhat callosely thickened. Scutellum minute. Elytra as wide as the prothorax, but scarcely so long, subparallel-sided, not narrowed behind, and broadly rounded at the apex; cylindrico-convex to the middle, thence convexly declivous, coriaceous, finely and confusedly punctured and moderately densely clothed with fine hairs; declivity rugulose, obsoletely striate, not margined below. Coxæ and underside, except the abdomen, darker, thinly hairy; the latter short. Legs ferruginous, the knees and tibiæ darker; femora very stout, inflated; tibiæ rounded externally, the anterior pair narrow, weakly armed, the remaining pairs dilated in the middle, and more strongly serrate above; tarsi very long, the first three joints somewhat stout and compressed.

Hab. Sumatra, from tobacco (Grouvelle).

This form is one of the most singular among the many remarkable male forms of the genus. The great length of the prothorax, and its peculiar shape, are quite characteristic; its apical indentation is only such as results from the conjunction of the two curves formed by the independently rounded sides of the anterior margin, and there is no dorsal sulcus leading to it. In spite of its great length, the prothorax is not, as in many males, produced into a peak in front of the head.

Xyleborus spatulatus, sp. n.

Fem. Oblonga, sat lata, haud cylindrica, castanea, prothorace et elytris ad apicem obscurioribus, subnitida, pilis brevissimis pruinosa; prothorace transverso semiovali, dorso

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post medium umbonato, postice dense fortiter punctato; elytris a basi pulvinatis, postice gradatim valde oblique declivibus, lineato-punctatis, interstitiis multipunctatis, declivitate utrinque late impressa, juxta suturam elevata, ad apicem subexplanata, subtus marginata. Long. 5·4 mm.

Female. Oblong, broad and somewhat depressed, not cylindrical, moderately shining, castaneous-brown, the prothorax before the discal elevation, the sides and apex of the elytra darker. Front somewhat flattened, subimpressed on either side over the mouth, rather strongly punctured, pilose; eyes not large, reniform; antennæ testaceous, normal. Prothorax broader than long, semi-oval, widest behind, the sides and apex conjointly rounded, hind-angles obtusely rounded, the base slightly curved; surface transversely gibbous behind the middle, strongly convex from side to side, pubescent with extremely short appressed hairs, anteriorly rough with an admixture of granules and rather remote larger transverse rugæ, posteriorly closely and strongly punctate with a smooth median line. Scutellum rather large, rounded trigonate, shining. Elytra wider at the base than the prothorax, and nearly double as long, the sides gently curved throughout, widest behind the base, subangulately inflexed at apex, the hind-margins obliquely rounded; surface rather depressed from side to side, convex and pulvinate from the base to the middle, thence obliquely declivous, rather indistinctly lineato-punctate, the interstices multipunctate, the punctures bearing small appressed hairs and a few short erect bristles in irregular rows; declivity broadly impressed and subexplanate at apex, with the suture elevated, the sides of the impression oblique and somewhat tumid above, and the inferior margin acute, more clearly striate. Underside testaceous, shining and thinly pubescent, sides of the elytra deeply inflexed towards the apex. Legs brown-testaceous, the tibiæ strongly dentate.

Hab. Borneo, Sarawak (Wallace).

The very short and nearly hemispherical prothorax, the broad and somewhat depressed elytra, and the complete absence of armature give the insect an appearance unlike that of any described species of the genus. I have, however, dissected the mouth parts of one of my two examples, and cannot find in them or in other details of structure, sufficient grounds for its removal. The malar armature is fine and setiform.

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Xyleborus wallacei, sp. n.

Fem. Elongata, cylindrica, picea vel badia, sat nitida, erecte setosa; prothorace subquadrato, dorso post medium gibboso, postice subasperate punctato; elytris striato-punctatis, interstitiis planis per totum alternatim tuberculis piliferis et punctis uniseriatim instructis, declivitate perobliqua, haud retusa, infra marginata. Long. 5·5 mm.

Female. Elongate, cylindrical, bright brown or piceous, rather shining, with erect scattered long brown hairs. Head impressed above the mouth on either side, with deep sparse piliferous punctures and a median elevated line, mouth fringed; eyes large, broad oval, emarginate, encroaching on the front, antennæ testaceous. Prothorax subquadrate, not longer than broad, the sides and apex separately and feebly rounded, the former slightly contracted before the middle, the anterior angles broadly rounded, the hind-angles subrectangular, the base subtransverse; dorsal gibbosity post-median, rounded and not sharply defined, surface with scanty pubescence at the sides, anteriorly convex, declivous and asperate with small rugæ, fine and close on the gibbosity, posteriorly subopaque, with fine subasperate punctures, the median line narrow. Scutellum small, rounded, convex, shining. Elytra as wide as the prothorax and twice as long, truncate at base, the shoulders obtuse, the sides parallel, somewhat narrowed towards the rounded apex; surface slightly rounded from the base to just behind the middle, thence very obliquely declivous, striate-punctate, the punctures rather large, shallow, the striæ scarcely impressed, the interstices shining, flat, with a single uniform series from base to apex of small setiferous tubercles alternating with punctures, the setæ long and erect; declivity carinate below, very slightly impressed on each side, chiefly over the 2nd interstice, and not evidently retuse or flattened. Underside concolorous, the legs somewhat lighter, the anterior tibiæ subangulate before the apex, the others rounded above, and moderately strongly serrate.

Hab. New Guinea, Dorey (Wallace).

The species is remarkably like the Colombian *X. grandis*, Eichh.; but it has the eyes larger, convex, more strongly granulated and more approximated in front, the prothoracic elevation post-median, the elytra more obliquely declivous, the interstitial setæ springing from tubercles throughout, and the first interstice not narrowed at the apex.

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Xyleborus destruens, sp. n.

Elongatus, ferrugineus vel piceus, nitidus, parce setosus, prothorace quadrato, elytris striato-punctatis, interstitiis uniseriatim subtuberculatis et punctatis, declivitate subretusa.

Fem. Quam *X. wallacei* minor, subangustior, prothorace distinctius gibboso, ad basin nitidiore, elytrorum interstitiis rarius tuberculatis et setosis, declivitate distincte impressa et postice subexplanata. Long 4·8–5 mm.

Mas. Brevior, robustior; prothoracis lateribus et angulis anticis distinctius rotundatis, dorso ante umbonem subdepresso et obsoletius asperato; elytris profundius striatis, striis juxta suturam irregularibus rugosis, apice magis retuso.
Long 3·9–4·3 mm.

Elongate, varying in colour from ferruginous-red to piceous, shining, scantily hairy, the hairs erect.

Female. Very similar to that of *X. wallacei*, smaller and narrower. Front less impressed over the sides of the mouth, the median carina less distinct; eyes smaller, not encroaching so far on the front: Prothorax just perceptibly longer than broad, the sides less narrowed in front, the apex somewhat flatter, the anterior and posterior angles rounded; discal elevation not postmedian, rather more defined and smoother, the basal half subnitid, with finer scarcely asperate punctures, weak towards the middle. Elytra narrower, the punctures of the striæ a little larger and more remote, the interstitial tubercles and punctures much more remote on the disc, the former feeble on the outer interstices; declivity impressed and very slightly concave towards the tip, very shining.

Male. Shorter but stouter than the female and more convex. Median elevation of front stronger; eyes very small, with only 4 or 5 ommatidia at their greatest width. Prothorax much more ample, broader than long, the sides more strongly rounded and gradually incurved in front to the apex, which is transverse in the middle; discal elevation situate farther back, less defined, surface depressed in front from the elevation to the apex but still convex, with finer asperation and an irregular smooth median line, posteriorly longitudinally convex, impressed on either side between the elevation and the hind-angles, more shining. Elytra shorter, but variable in length, narrower than the prothorax, more convex, more strongly punctate-striate, the interstices subconvex; surface

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with an irregular shallow sutural impression beginning behind the base, rugulose, infuscate and more strongly tuberculate; declivity more retuse, beginning subabruptly above, shining, irregular, more obsoletely sculptured.

Hab. Gilolo (Wallace); Java.

I have received a good series from Java, where this species, in association with *Glenea novemguttata*, Cast., and a species of *Helopeltis* has inflicted very grave damage to cacao-plantations.

Xyleborus andamanensis. sp. n.

Fem. Oblonga, subnitida, nigro-picea, parce pilosa; prothorace subquadrato, lateribus et apice leniter singulatim rotundatis, dorso gibboso, postice sublævi; elytris dilutioribus, lineato-punctatis, interstitiis planis, seriato-setosis, declivitate perobliqua, subopaca, subtus acute marginata, striata, striis ad apicem sinuatis, interstitiis granulis elevatis parvis æqualiter notatis. Long 3 mm.

Female. Oblong, moderately shining, scantily hairy, deep piceous, the head and elytra somewhat lighter. Front convex, strongly punctured, impressed on either side over the mouth, the impressions separated by a median raised line; eyes oblong, deeply emarginate; antennæ brown-testaceous. Prothorax as broad as long, subquadrate but with the sides and apex evidently, though slightly, and the anterior angles more strongly rounded, hind-angles obtuse, the base subtruncate; surface transversely gibbous in the middle, anteriorly rather finely granulate-asperate, posteriorly moderately shining, finely reticulate, and obsoletely punctured. Scutellum triangular, subnitid, longitudinally impressed. Elytra scarcely as wide as the prothorax and less than a half longer, subparallel-sided, strongly rounded at the apex, its margin acute and subexplanate; surface cylindrico-convex to the middle, thence obliquely declivous, lineato-punctate, with very shallow variolose punctures, intersticos flat, rugulose, with uniseriate erect hairs arising from small points, which become elevated before the middle, declivity convex, subopaque, with feeble striæ towards the apex, the 1st somewhat impressed, the others sinuate outwards, interstices with uniform rows of small granules, obsolete towards the tip of the 1st interstice.

Hab. Andaman Is.

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About the shape of *X. interjectus*, Blandf., but smaller, with the prothorax less narrowed towards the apex, though as evidently rounded in front; the elytral sculpture is characteristic and resembles somewhat that of *X. seminitens*, Blandf., which species has not a subquadrate prothorax.

Xyleborus submarginatus, sp. n.

Fem. Elongata, nitida, ferruginea, elytris versus apicem plus minusve infuscatis; prothorace oblongo, lateribus postice subparallelis, apice obtuse rotundato, inde subquadrato, dorso medio nodoso, postice nitido, obsolete punctato; elytris striato-punctatis, interstitiis rarius subtilius uniseriatim punctatis et setosis, declivitate obliqua, convexa, opaciore, interstitio 1° dilatato, utrinque medio tuberculato, et granulis nonnullis ante tuberculum et ad apicem ornato, interstitio 3° obsoletius granulato, margine inferiore sat acuto crenato. Long. 2·4–2·5 mm.

Resembling *X. parvulus*, Eichh., larger, darker in colour, the prothorax more parallel-sided and obtusely rounded at the apex, hence subquadrate. Elytra with the rows of punctures more distinctly expressed, rather deeper, the punctures themselves closer, the interstitial punctures finer, the setæ longer, declivity less shining, the 1st interstice with a stronger tooth, preceded by a few fine granules at the summit of the declivity and one at the apex, the 2nd interstice with two or three granules at the summit, the 3rd with a series on the declivity, its inferior margin distinctly acute and crenate.

Hab. India, Belgaum (Andrewes); Ceylon (Thwaites, in Mus. Oxon.); Celebes (Wallace); New Guinea, Dorey (Wallace).

This species was referred to by me (Ann. Nat. Hist. ser. 6, xv., p. 332) as a variety of *X. parvulus*. Having since seen the type of that species and series of both forms from Ceylon, I feel constrained to separate it by the characters given above. It comes close to *X. dilatatus*, Eichh., in many respects, but differs from the description at least in possessing a prothorax which is longer rather than shorter than that of *X. parvulus*,

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in the stronger dentation of the elytral apex, and in its decidedly acute and crenate inferior margin; a point in which, as in the shape of the prothorax, it approaches the species of Eichhoff's second division.

Xyleborus subcribrosus, sp. n.

Fem. Subelongata, cylindrica, nitida, castanea, parce longius pilosa; prothorace haud transverso, apice rotundato, disco subaequaliter convexo, post medium fortiter punctato, linea media lævi; elytris fortiter lineato-punctatis, interstitiis planis punctis piliferis remotis notatis, apice fortiter declivi, impresso et longitudinaliter concavo, pernitido, lineato-punctato, interstitiis præcipue in parte superiore subtiliter seriato-tuberculatis. Long. 3·4 mm.

Female. Subelongate, cylindrical, shining, deep castaneous, with long fine scanty pubescence. Front subconvex, shining and rugosely punctured towards the mouth, dull towards the vertex, median line narrow, elevated, shining, pubescence long, erect; eyes broad oval, narrowly emarginate. Prothorax about as long, or a trifle longer, than broad, broadly rounded at the apex, the sides very slightly rounded, the greatest width being at the hinder third, hind-angles obtuse, the base truncate; disc uniformly convex from base to apex and not gibbous, asperate with close imbricate rugæ before the middle, behind strongly and closely punctured, the punctures subasperate at the sides, finer towards the middle, median line impunctate, reaching the middle, interspaces shining, pubescence scanty, marginal. Scutellum rounded, convex, shining. Elytra as wide as the prothorax and fully a half longer, truncate at the base, with rectangular shoulders, subparallel-sided and not narrowed behind, rather abruptly and obtusely rounded at apex; surface cylindric, the apical third strongly declivous, with non-impressed rows of strong punctures, the sutural row irregular, interstices flat, subrugulose, shining, with uniseriate remote piliferous punctures, replaced before the declivity by elevated points, declivity strong but not abrupt, broader than long, retuse and concave from base to apex, which is subexplanate, margined subacutely below, very shining, with three rows of shallow punctures, the interstices rather wide, the 1st with one small tubercle near the summit, and traces of others near the tip, the 2nd and 3rd with two or three irregularly-placed small tubercles. Below concolorous, thinly pilose.

Hab. Singapore (Wallace).

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The single example has the limbs broken; it is a rather distinct form, with the elytral characters of the species of Eichhoff's second division, though the rounded apex of the prothorax would place it in his third division.

Xyleborus dolosus, sp. n.

Fem. Subelongata, cylindrica, nitida, castanea, parce pilosa; prothorace oblongo, apice fortiter rotundato; dorso post medium sat distincte punctato, linea media lævi; elytris lineato-punctatis, interstitiis planis uniseriatim punctatis, 1°, 3° post medium seriato-tuberculatis; declivitate obliqua, nitida, tenuiter punctata, in linea interstitii 1° utrinque sat valide bituberculata, infra marginata, ad apicem medium subemarginata. Long 2·4 mm.

Female. Subelongate, cylindrical, shining, castaneous-brown, with very scanty, rather long pubescence. Front subimpressed on either side, with an indistinct median longitudinal elevation, subrugosely punctate and pilose; eyes large, broad oval, feebly emarginate; antennæ testaceous-yellow. Prothorax oblong, strongly rounded at the apex, the sides very gently curved from before the middle to the broadly rounded hind-angles, base subtruncate; surface very convex before the middle, cylindrical and slightly flattened posteriorly, the junction not marked by any evident nodus, the anterior half rather finely and closely asperate, the posterior half shining, moderately closely and distinctly punctured, the punctures absent over the median line and a small spot on either side, and coarser at the lateral margins, pubescence scanty, marginal, erect. Scutellum rounded oblong, infuscate, shining, subimpressed. Elytra wider than the prothorax at its extreme base, and less than a half longer, truncate at base, with rectangular shoulders, subparallel-sided and slightly narrowed towards the apex, the hind-margins separately rounded, as in many species of *Pterocyclon*, forming a very shallow emargination at the suture; surface subcylindrical at the base, very obliquely declivous from the middle to the apex, moderately strongly lineato-punctate, the interstices flat, remotely and more finely punctured; declivity somewhat flattened behind, shining, indistinctly punctured, rather sharply margined below, 1st interstice with about six, 3rd with about five tubercles, beginning near the middle of the elytra, and becoming strongly posteriorly, the apical pairs of the 1st interstices forming four well-marked tubercles on the declivous area, outer interstices finely tuberculate towards the extremity. Underside concolorous, legs testaceous.

Hab. Borneo, Sarawak (Wallace).

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The shape of the elytral apex is like that found in many species of *Pterocyclon*, and the species may be regarded as intermediate between such forms as *X. confusus*, Eichh., and its allies, and *X. fallax*, Eichh.

Xyleborus laticollis, sp. n.

Fem. Subelongata, nitida, badia, elytris piceo-ferrugineis ; prothorace amplo, suboblongo, lateribus leniter, apice fortiter rotundato, dorso transverse subelevato, postice subtiliter sparsim punctato ; elytris prothorace angustioribus, postice angustatis, striato-punctatis, interstitiis lineato-punctatis, postice tuberculatis, apice fortiter oblique declivi, subimpresso, fundo inermi, lateraliter in linea interstitii 3i seriato-tuberculato. Long. 2·7 mm.

Female. Subelongate, shining, sparsely pilose. Head bright-brown, front subconvex, dull, punctured, with a fine subelevated median line, mouth thinly fringed. Prothorax a little longer than broad, ample, broadly rounded in front, the sides nearly straight, inflexed slightly towards the rounded hind-angles, base truncate ; surface cylindrical behind, convex and declivous at the apex, with a scarcely elevated transverse nodus before the middle, bright-brown with a darker shade towards apex, scarcely hairy, granulate in front, behind shining, finely and sparingly punctured, with a smooth median line. Elytra narrower than the prothorax and a third longer, the shoulders subobtuse, the sides nearly parallel to the middle, thence narrowed, the apical margin truncate in the middle; surface cylindrical, piceo-ferruginous, shining, with thin rather long hairs, rather strongly punctured in substriate rows, the sutural stria markedly impressed shortly after the base, interstices flat, with as strong but more remote uniseriate piliferous punctures, replaced by small tuberculate points before the declivity ; the latter beginning at the apical third, oblique, flattened, shining, indistinctly striate, its fundus unarmed, the 3rd interstice callose and tuberculate, the outer interstices less strongly tuberculate. Underside and legs testaceous, the abdomen darker.

Hab. India, Kanara (Andrewes).

This species belongs to the subdivision of which *X. saxeseni*, Ratz., forms part, but is quite different from that species in sculpture and in the much larger and more ample prothorax, which looks almost out of proportion in comparison with the elytra.

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Xyleborus andrewesi, sp. n.

Fem. Elongata, piceo-fusca, antennis et pedibus flavis, subnitida, sat breviter erecte pilosa; prothorace oblongo, apice late rotundato, lateribus parallelis, dorso post medium sat conferte punctulato, linea media lævi; elytris post medium gradatim attenuatis, lineato-punctatis, interstitiis seriato-setosis, 1° a medio, 3°, 5° in declivitate tuberculatis, hac obliqua, pruinoso-opaca, interstitio 2° impresso. Long. 2 mm.

Female. Elongate, moderately shining, pitchy-fuscous, the base of the prothorax and apex of the elytra somewhat lighter, the antennæ and legs yellow, with short moderately close erect pale hairs. Front subimpressed on either side over the mouth, dull, finely shagreened, not strongly punctate nor hairy; eyes rather large, deeply emarginate. Prothorax oblong, exactly parallel-sided, broadly rounded at the apex, the hind-angles rounded, the base truncate; surface with an ante-median transverse elevation, declivous in front and asperate with imbricate rugæ, behind cylindrical, slightly depressed, subnitid, with moderately close and rather fine punctures, the median line impunctate, the interspaces transversely rugulose, pubescence thin, longer over the apical, shorter but present over the basal half. Scutellum triangular, partly concealed by hairs. Elytra as broad as the prothorax and a half longer, with subrectangular shoulders, parallel-sided to the middle, thence gradually and subacuminately narrowed to the apex, hind-margin seen from above short and transverse; surface subcylindrical to behind the middle, thence gradually declivous and convex, rather finely punctured in rows, the punctures shallow, bearing minute hairs, interstices flat, rugulose, with stronger seriate hairs, the 1st and 3rd seriato-tuberculate, the tubercles beginning on the 1st before the middle, rather remote, and weak towards the apex, on the 3rd about the middle, and strong to the apex, the 5th and outer interstices with finer tubercles towards the tip; declivity opaque, impressed along the 2nd interstice, the 3rd subcallose. Underside concolorous.

Hab. India, Belgaum (Andrewes).

Allied to *X. exiguus*, Walk.; but larger, more elongate, and much more gradually attenuated behind; the first and third interstices alone armed before the declivity with much more remote tubercles, the declivity opaque. One example.

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Xyleborus exiguus.

Bostrichus exiguus, Walk., Ann. Nat. Hist., ser. 3, iii., p. 260 (1857)[1].
Xyleborus muriceus, Eichh., Rat. Tom., p. 506 (1879)[2].

Hab. Ceylon[1]; Andaman Is.; Burma[2].

I have a pair from the Andamans, which have been identified by comparison with Walker's type. Through the courtesy of Herr Schaufuss I have been able lately to compare them with that of Eichhoff, who has published an ample description of the species.

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IX. *Notes on Dyscritina longisetosa*, Westw. By E. Ernest Green, F.E.S.

[Read March 18th, 1896.]

The accompanying figures represent what I suppose to be a more advanced stage of the interesting little insect described by the late Prof. Westwood, under the name of *Dyscritina longisetosa* (Trans. Ent. Soc. Lond., 1881, p. 601, pl. xxii., fig. 1).

My example of the insect is rather darker coloured than the type, the whole of the upper parts being dark reddish-brown, without any pale bands on the abdomen; it has, however, the two small pale patches on the posterior angles of the prothorax; and there is a pale median line bisecting each of the thoracic tergites longitudinally, which is carried forwards to the middle of the head, where it bifurcates, the branches turning sharply off to a point on the margin immediately in front of the eyes.

Westwood does not definitely state the dimensions of his insect; but gives 8 lines as the length of the caudal filaments, remarking that these are "nearly three times the length of the entire insect." In his figure, however, he gives a scale, indicating the lengths of the parts, by which I find that the body is 6 mm. long, and each filament 17 mm. In my specimen these proportions are considerably altered, the body being 8 mm. long, while the caudal appendages attain a length of only 6½ mm.

In Westwood's description these caudal appendages are said to be composed of more than fifty minute articulations. In the present specimen, the two appendages, though nearly of equal length, consist of a different number of joints, there being seventeen in one and twelve only in the other. I at first thought that they might be imperfect; but a careful examination of the extremities shows a natural rounded termination quite unlike the apices of the preceding joints. There is a very long basal joint, about equal to the subsequent six; the remaining

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joints are subequal in length, but gradually diminish in thickness. The appendages are finely setose, and there are a few stout spines on the basal and following six or seven joints.

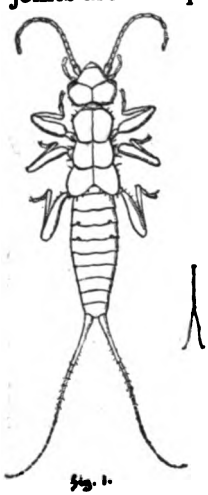

Fig. 1.

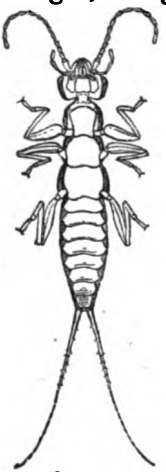

Fig. 4.

The antennæ have undergone very little change. They still contain fifteen joints; but the second is very small and sunk into the apex of the large basal piece, which bears several stout spines.

Fig. 2.

There is an important change in the structure of the legs, three joints being now apparent in the tarsi; the second joint, is, however, very small, and firmly fixed to the preceding one, the line of separation being rather inconspicuous. The femora are distinctly channelled for the reception of the tibiæ. There is no pad between the claws.

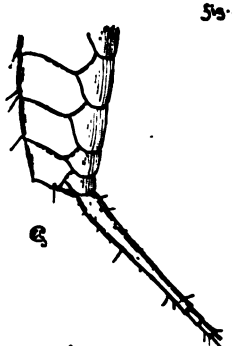

Fig. 3.

Fig. 5.

Fig. 1.—Outline of insect, dorsal view.
,, 2.—Head, from below.
,, 3.—Terminal segments of abdomen, from the side.
,, 4.—Outline of insect, ventral view.
,, 5.—Tarsus and part of tibia of anterior leg.

The mouth parts, as far as can be seen without dissection, are as described by Prof. Westwood; the maxillæ are perhaps rather longer and more falcate.

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The similarity of structure to that of the *Forficulidæ* is most marked in the specimen under examination. On each of two tergal plates, near the base of the abdomen, appear a pair of well-marked glandular folds, corresponding with the scent-glands found in a similar situation in many earwigs. On the ventral surface, the sternal plates of the thorax are very large and broad, each projecting backwards, and covering part of the following segment. The legs are widely separated, and the coxæ small and cylindrical. The tergal and sternal plates of the abdomen are fitted together in the imbricating fashion which is almost peculiar to the *Forficulidæ*. The extremity of the abdomen, between the cerci, is closed by a vertical plate divided transversely into two or more pieces.

The specimen from which the above notes were taken, is now deposited in the Natural History Museum, Cromwell Road. Westwood's type of the insect is presumably in the Oxford Museum.

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X. *On the Courtship of certain European Acridiidæ.*

By Professor Edward B. Poulton, M.A., F.R.S., F.L.S., etc.

[Read April 1st, 1896.]

The extraordinarily fine and hot weather in Switzerland at the end of August and beginning of September last year (1895), was very favourable for the observations which are here recorded. I was then staying at the Weisshorn Hotel, high above Vissoye, in the Val d'Anniviers, 7690 feet in elevation. Certain species of *Acridiidæ* were excessively abundant in the immediate neighbourhood of the hotel, species moreover which afforded examples of very different methods of courtship.

In working at this subject I received the greatest assistance from my two friends, Mr. F. Jenkinson and Mr. F. V. Dickins: their keen powers of observation enabled me to add many new facts of much interest, and also afforded valuable confirmation upon the most difficult points. Mr. Jenkinson observed with me for hours together on several occasions, so that we were able to compare our impressions as we received them.

Dr. Sharp has kindly identified the species for me, comparing my specimens with a Brunner collection at Cambridge.

The object of this enquiry was to make out the methods employed by the males in the courtship of the females, and especially the part played by stridulation. Dr. Sharp, in the Cambridge Natural History (Vol. v., p. 286), insists on the insufficiency of observations on this point, and I therefore hope that this work has not been in vain. The following observations suggest that the true significance of the latter is to be found in its use during courtship. In only a single species of those observed, *Stethophyma fuscum*, did the males commonly stridulate without reference to the females, and merely in rivalry with each other. In all the other sound-producing species the power seemed, almost without exception, to be

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exercised with direct reference to females, or in rivalry to other males in the presence of a female. In the case of *Psophus stridulus*, true stridulation was only observed when the close proximity of a female had evidently thrown the male into a state of excitement.

The following considerations also support the same conclusions. In *Pezotettix pedestris*, both sexes have rudimentary wings and the male never makes any audible sound. Nevertheless, when he is seated on the back of the female attempting to pair, and during coitus itself, he continually moves his third legs alternately as if in stridulation. I believe that this movement is a vestige of an ancient and long-lost power of producing sound. Although stridulation is usually produced by a symmetrical movement of the third legs, it will be shown that this is not the case with *Stenobothrus elegans*. There is therefore no objection to be raised against this character of the movement in *Pezotettix*. Another view, and that held by my friend, the learned Orthopterist, Henri de Saussure, is that sound is really produced, only we cannot hear it. He holds that the sound is merely the outward expression of the elated feelings of the male *Pezotettix*.

Dr. Sharp, too, considers from the presence in apparently dumb species of well-developed tympana—and this is their condition in *Pezotettix*—"that the Orthoptera provided with acoustic organs, and which we consider dumb, are not really so, but produce sounds we cannot hear, and do so in some manner unknown to us" (Cambridge Natural History, Vol. v., 287). On the other hand, it may be urged that the perception of vibration by means of tympana may be of great value in the life of an organism, even if the organism were incapable of producing sounds, and that it may be retained for some more general use when its original special function has ceased to exist.

But in any case this movement of *Pezotettix* is conducted with an apparatus homologous with that by which sound is produced in other *Acridiidæ*, and yet one in which the special sound-producing structures are absent. The tegmina are too short to be brought into their usual relation with the femora, and the ridge on the inner face of the latter is without the "musical beads," although strongly chitinized and prominent as though it had previously possessed significance in this respect.

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Further evidence in support of this explanation is to be found in the fact that *Pezotettix* makes the movement when he has succeeded in capturing the female and when pairing has actually begun. In the other species observed the normal arrangement was for the male to stridulate apparently to charm or please the female *before* leaping on her; stridulation after this occurring only in certain special cases (one observation on *Stenobothrus hæmorrhoidalis*, and one on *Stethophyma fuscum*, in which it is to be explained as an answer to another very persistent male).

If, however, as I suppose, the movements of *Pezotettix* are merely vestigial, we can quite understand their association in the nervous system with those stronger nervous impulses which are concerned with the successful issue of courtship, rather than with the impulses concerned with courtship itself. According to this view the functional stridulation is associated with anticipation while the vestigial stridulation is only evoked by realization. It should be added that it is quite possible that these movements of the male *Pezotettix* may have a stimulating or perhaps merely a soothing effect on the female.

The comparison between *Pezotettix* and the other species supports in another way these conclusions as to the essential significance of stridulation in courtship. In the latter kinds, so far as they were sufficiently observed, the female was treated with considerable ceremony; in *Gomphocerus* a peculiar attitude was assumed, movement of some of the appendages of the head was made, and the female was in some cases patted or stroked, in addition to the most assiduous stridulation. The latter was never omitted in any species in which we could detect any sound. But the little male of *Pezotettix*, being apparently without any power of charming the female, behaves in a manner entirely different from any of the others described below. He lies in wait, leaps on the female, and captures her unawares. Then, when he is firmly seated, the male attempts to charm her by nibbling with his mandibles, and perhaps by the effect of the alternate movement of his third legs.

The general impression left by the whole of the observations recorded below was favourable to the theory of sexual selection, and to the view that the stridulating

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apparatus has been evolved by the agency of this principle rather than by that of natural selection.

Others may draw opposite conclusions from the same observations, which I therefore set forth by themselves, apart from general theoretical considerations. I believe that the observations themselves are correct, and that the uncertain points are stated with due caution.

Pezotettix pedestris.

August 29, 1895.—I watched a pair of *Pezotettix pedestris* continuously for about an hour and a quarter, viz., from about 2.30 p.m. to 3.45. The day was fine and the sun powerful, and this had been the case for many days previous to the 29th.

When first observed, the male was seated on the back of the female, the anterior legs being clasped round her prothorax, but every now and then one of them was passed round her head and sometimes even over the eye. Twice the female was seen to raise her leg and sweep the male's leg off her face. The male's second pair of legs apparently clasped the posterior part of her first abdominal segment, fitting in between the femora of the female's third pair of legs and her body. The male's third pair of legs were not used for maintaining his position, but were held either horizontally or inclining upwards posteriorly, the tibiæ forming an acute angle with the femora, and the tarsus being raised so as to form an acute angle with the tibiæ. For nearly the whole of the time of observation the male's third legs were jerked up and down alternately, the strokes not succeeding each other very rapidly. No audible sound was produced. No corresponding movement was seen on the part of the female.

In attempting to copulate, the male let himself down, sometimes on one side and sometimes on the other, sufficiently far to bring the extremity of the abdomen below that of the female. The terminal segments of the male's abdomen were then turned upwards and inwards towards the external generative aperture of the female, with which the everted male organs were brought into contact. No movement of the corresponding female parts was seen, but contractions of the whole abdomen occasionally took

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place. In the above-described attitude the hold of the male appeared to be very precarious, and it seemed that he would have been shaken off by a comparatively slight movement on the part of the female.

During the second half of the period of observation, the male made more frequent and vigorous attempts, and I noticed that from time to time he gently nibbled the female with his mandibles in the dorsal and upper part of the lateral thoracic regions. The female, however, appeared to be entirely indifferent to his attentions; and sometimes when the male was making the most energetic attempts she would calmly begin to eat the leaf of a plant. On two occasions she finished, or nearly finished, a small leaf, and many times nibbled parts of leaves. Although she seemed to prefer the green leaves, she sometimes ate portions of brown ones. Five times the female ejected fæces; once I thought the male did so, but it may merely have been getting rid of some foreign particle which had accidentally adhered. In the case of the female there was no doubt.

Although the female did not attempt to get rid of the male, she showed her indifference to his presence not only in the manner already described, but by walking and hopping about, often at the most inconvenient times. By 3.45 copulation had not commenced, and I could wait no longer. Both insects were then captured for identification.

All the observations recorded above were made quite close to the insects. By keeping as still as possible, and moving very gently when it was necessary to follow them, it was easy to bring the eyes within six or eight inches of the insects without disturbing them at all.

August 30.—I saw many of the same species in copula beside the upper road, or rather path, leading from the Weisshorn Hotel to Zinal. The terminal segments of the male's abdomen are turned upwards, in the position indicated by the attempts already described. The alternate movements of the third legs continue from time to time during coitus: in one case (which may have been the beginning of copulation) a female was seen to stretch out the third legs from time to time, and make a rapid shivering movement. With the above exception, the female hopped and walked about freely during the pro-

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cess, the male being apparently firmly seated on her back.

August 31.—A pair were found in copula in the Alpine garden close to the Weisshorn Hotel. The female was seen to eat freely, and once to void excreta, while the male was actively moving his third legs. This observation was confirmed by F. Jenkinson. These remarkable alternate movements of the male's third legs during coitus were also seen by F. Jenkinson and me in a very large number of cases at other times. In a single case observed by F. Jenkinson on August 31, the male's legs were at one time rapidly vibrated laterally, being moved simultaneously and not alternately, as in the usual movement. This perhaps corresponds to the shivering movement seen by me in the female on August 30th.

September 1.—This latter observation was confirmed by me in the Alpine garden. In this case the beginning of the act was seen. The male appeared to be much excited, and the shivering movement occurred from time to time, just before and after the beginning of the act. The female, which possessed only one leg of the third pair, was quite motionless throughout. At the commencement of the act she expelled fæces, which were moist and quite different from the dry ejecta seen on other occasions. In this and the complete passivity of the female there is probable evidence that she was much influenced by the act. This passive appearance was entirely distinct from the indifference manifested in so many of the cases previously observed, in which, however, the act had either not begun, or was probably far advanced. Shortly after coitus the pair remained motionless for a considerable time.

September 2.—Up to this date the events immediately preceding pairing, and the pairing itself had been observed with care, but there was no evidence to show how the male became seated on the back of the female. I was very anxious to find out how this occurred, and whether there was any preliminary courtship by stridulation or otherwise, although the species had never been heard to stridulate. At this date, F. Jenkinson observed, and I was able to confirm, that the males leap upon the females when they come within a distance of about three inches, but apparently do not notice them at a much greater distance. Their attention appears to be directed to the

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female by its movement, and they then leap with the greatest accuracy F. Jenkinson obtained these results by inducing captured females to leap from his hand in the direction of a male. On one occasion he saw a male approach and leap upon another male, probably mistaking it for a female; there was a tussle, in which one appeared to try to bite the other. It thus appeared evident that there is no preliminary courtship of any kind, but that the male takes the female by surprise, and leaps upon her before she is aware of his presence. This conclusion was abundantly confirmed later on.

September 3.—F. Jenkinson and I observed a pair on the grassy slopes below the Bella Tola. The male had lost one of the legs of the third pair, and the female had one of them apparently injured. The male was seated on the back of the female, and was energetically attempting to copulate much too far forward in the middle ventral line. We watched his continual attempts for about fifteen minutes, at the end of which period he was no nearer to success than at the beginning. This failure, when the female was evidently ready, and kept opening the generative orifice, may have been due to the absence of the leg. Although this limb is not used to hold firmly, the absence of it may have affected his balance. At any rate no failure of this kind was seen on any other occasion.

Later on, about the middle of the day, we came to a flat piece of ground covered with scanty grass, at the bottom of the zigzags by which the Bella Tola is ascended. The strong sun and the position of the ground made the place extremely hot, and as both sexes of the *Pezotettix* were very abundant, it appeared a good opportunity for observing the pairing habits. The males were often seated on stones, or other slight eminences; thus placed, and with the head and anterior part of the body raised, they were in a very favourable position to see and leap upon any female which approached within three inches, or sometimes even a greater distance. If the leap is a failure, the male at once begins an active pursuit, leaping more quickly and further than the female. In this way it often happens that he loses sight of the latter, or, is brought nearer to another female, whom he at once attempts to capture. One main cause of failure in the pursuit is that the male has very little, if any, power of

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seeing a female between his leaps, unless his attention has been directed to her by the movement of the leap itself. Hence the pauses, often greatly prolonged, between the successive leaps frequently lead to the escape of the female. Furthermore, the leaps made by the male, when lying in wait for the female, were much better aimed than those made in pursuit. It is probable that in the former case he takes very careful aim; for he turns his head and antennæ in the exact direction of the female, and pauses before leaping, often making a slight rocking movement of the anterior part of the body. Occasionally this movement was seen in the female also.

When the male leaps upon her unawares, as I have described, the female almost invariably tries to throw him off, and generally succeeds. If, however, she failed in the first attempt, in most cases she yielded forthwith, and, probably as a result of these favourable conditions as regards temperature, pairing was effected in a very short time, sometimes even in a few seconds.

In one instance a male leaped upon a female and was thrown off; the female was then driven round, so that in a few minutes she again came within the range of his leap. The second time he was successful, securing a firm hold, and beginning to nibble the female with his mandibles. All resistance ceased, and pairing took place in a few minutes.

Very occasionally the alternate strokes, but only once or twice repeated, of the male's third legs were seen when the opposite sexes were near together. I believe, too, that the same movement was made by the female, though still more rarely. One female, when near to a male, seemed to be excited, and raised her third legs, which quivered from time to time. Any such indications were very rare in the female. In nearly all cases she was taken by surprise, and only yielded when very firmly held.

The female must be influenced in some way by the male holding her and caressing her with his mandibles; for his position, when attempting to copulate, is very precarious, and he could be easily shaken off. It appeared, however, that the males did not begin to make any such attempts until the females had ceased to resist.

In one single instance the female did not yield, although very firmly held; but it is probable that she was immature, or injured, or in some way unfit for pair-

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ing, as the male finally left her of his own accord. This observation was made by both of us, and was of great interest. When we first saw them, the male was firmly holding the female, but she kept struggling violently, and trying to kick him off with her powerful third legs. On at least three separate occasions the pair rolled over, and remained in this position, with the male beneath, for about half a minute. At such times the female was unable to struggle at all successfully, and it seemed possible that the male, when he was nearly unseated, caused the pair to roll over; we could not, however, be sure of this. Ultimately the male leaped off voluntarily, as I have already stated. One side of the dorsal surface of an abdominal segment was wounded in the female, but as the injury did not appear to be fresh, it is not probable that the male caused it.

In one or two cases the female, and once the male, expelled fæces just before or during copulation. The fæces were of the character already described, and not in the usual dry state.

In no single case was any preliminary courtship witnessed in this species. There was no stridulation, no display of colour or attitude. It was entirely a question of capture, the females being almost invariably, at any rate at first, unwilling prisoners, although occasionally they showed indications of excitement in the presence of a male.

It is highly probable that pairing takes place many times in this species, and even more than once with the same male.

There was an extremely high proportion of individuals in coitu, even allowing for the fact that their habit of freely jumping about renders them much more conspicuous than the unpaired males and females. The proportion was far higher than that of any other Orthopterous insect observed during this visit to Switzerland; it is possible, however, that the principal pairing time of other species is earlier in the year.

Gomphocerus sibericus (var.).

This form was excessively abundant round the Weisshorn Hotel, no other species approaching it in numbers. On one occasion, after heavy rain, F. Jenkinson saw immense

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numbers of them lying in the path apparently dead; but after the sun had warmed them they all recovered.

August 30.—At this date I had a good opportunity of watching the habits of the males in the presence of a female. About a mile from the hotel, along the upper road to Zinal, at about 11 a.m., I came upon a spot which, on account of its aspect and slope, had not long been warmed by the sun, so that the insects were only just beginning to bestir themselves. Here was a little group of this species—two males and a female—probably close to the place in which they had passed the night. The female was resting quietly on a small piece of rock, slightly moving her abdomen, probably in relation to respiration. Later on she drew each antenna beneath the first leg of the same side, or perhaps drew the leg over the antenna. It is probable that this movement is intended to wipe off the dew. The males often did the same, and the female rubbed its eye, probably for the same purpose. This explanation is all the more probable because I did not see these movements at any time when the heat of the sun was sufficient to have dispersed the dew; although the species was carefully observed on many occasions. One male, standing by the female, was stridulating when I came up; the other was behind motionless. These three insects were extremely shy, although this was by no means the case at other times when individuals of this species were watched in the heat of the day. Although I approached so that my shadow was behind me, and very gently, the male beside the female was alarmed at each slight rustle or movement, raising himself on his legs and erecting his antennæ, apparently thoroughly on the alert. Then when I kept perfectly still he resumed his former position and depressed the antennæ towards the female, both of whose antennæ were also generally depressed. He did not continue to stridulate, but, after remaining almost motionless for some ten minutes, except for cleaning his antennæ now and then, turned his back on the female and apparently began eating the heather. In a few seconds the other male stridulated once or twice: the effect on the first male was instantaneous; he stridulated for a second or two and then walked back to the female, depressed one antennæ towards her and patted her on the thorax with one of the first pair of legs. After all this

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attention she made no apparent movement, and the other male did not make any further advances. The active male then walked away and met another female, stridulated beside her until she also walked off. Another male close at hand stridulated, and the active one immediately replied, although in this case no female was near.

These observations illustrate the habits of the species in courtship, the males, as Mr. F. V. Dickins also pointed out to me, always running after the females and never jumping, although both sexes jump very actively when disturbed. The use of stridulation as one of the tactics of courtship was clearly seen, the rivalry between the two males near the female being particularly interesting. The same occasion gave rise to the other method of courtship, viz., patting the female. The position of the male's antennæ suggested attention to any movement the female might make, or to anything she might do.

These notes also illustrate the immense abundance of the species, the active male had only to walk two or three inches away from the group of three in order to come across another female and male.

I think that, in observations of this kind, it will be useful to watch the species under many different conditions, especially as regards temperature. In the hottest places courtship is most energetic, and we have the most favourable opportunity for seeing the whole process carried through to completion, as in the case of *Pezotettix* already described; but when the temperature is lower, and especially when the warmth of the sun has only just roused the insects into activity, many interesting details may be witnessed which are often passed over or hurried through in times of greater energy.

In spite of the excessive abundance of the species and the almost constant attention of the males to the females, a successful termination to courtship was witnessed in no single instance, and only two or three pairs were seen in coitu. One of these was found on August 29th, a little below the hotel. The male, unlike the *Pezotettix*, was unable to retain his hold, and when the female jumped, as she did freely, he was dragged along on his back, and retained this position for a considerable time in the intervals between two successive jumps. It is probable that with this species, the pairing season was nearly over;

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and this conclusion is supported by the fact that the females were often seen engaged in oviposition.

August 31.—Jenkinson and I watched several females ovipositing in the loose earth on a very hot slope just outside the hotel, and in the beds of the little Alpine garden. The female thrusts her abdomen deeply into the earth and remains in this position for some minutes. On two occasions a female, after withdrawing her abdomen, was seen to rake the ground vigorously with her third legs, and, in one case, witnessed by Jenkinson, she steadied herself by holding a plant stem with her mandibles. We several times dug up the earth and searched for the eggs, but without success. At this date I found another pair of this species in coitu, on the path just below the hotel.

Gomphocerus sibericus appears to be a very general feeder, and its extraordinary abundance in the immediate proximity of the hotel was probably due to the presence of horses' and mules' dung, and other refuse upon which they fed. Every patch of dung upon the path was surrounded by dozens of individuals.

August 31.—F. Jenkinson and I watched the males pursuing the females near the hotel. It often happened that when a male came up to a female he extended the maxillary and labial palpi towards her, and raised himself on his legs in a very characteristic and remarkable attitude. At other times these movements occurred at a later stage of courtship. The movement of the palpi strongly suggested their use as organs of sense. When the female ran away, as she generally did, the male pursued, always trying to get in front of the female and thus stop her. The male ran faster than the female, and altered his direction so as to approach the female almost at right angles to the course she was pursuing. After the preliminaries of courtship—pursuit, stridulation, attitude, and movement of the palpi—the male, standing beside and close to the female, tries to jump on her, making a curious short chirp as he does so. The attempts were, however, always unsuccessful in the cases observed by us. Stridulation is in this species of definite length, and ends in two or three short chirps; in most cases the male then instantly approaches still nearer and tries to jump on the female with the short chirp already described.

Neither Jenkinson nor I can remember the exact

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order in which the male went through the various phases of courtship. It is probable that the order varied greatly, and that some of the phases were often omitted.

September 2.—On this and many other occasions the males were often seen to leave the female they were pursuing and, apparently without knowing it, to follow some other female they accidentally came upon in the course of the pursuit. A male pursuing a female was once seen to approach and jump at the male of *Pezotettix*, having apparently mistaken it for the female.

September 3.—On the grassy slopes below the Bella Tola, a male observed by F. Jenkinson and me was greatly excited by the pair of *Pezotettix* already described as attempting, but unable to copulate. He stood in the characteristic attitude, walked round them, and finally stood in front and stridulated for the usual length of time and with the usual ending, he then advanced as if to jump, but before doing so became satisfied that he had made a mistake, and walked away. It was evident that he had mistaken the pair for the female of his own species.

Just below the zigzags up the Bella Tola we saw a male which, standing by a female, repeated the stridulation four times with the usual conclusion on each occasion, and then after all this attention let her walk away unperceived. This and the other facts already described seem to show that the males were very unobservant. In this respect their behaviour was very different from that of *Pezotettix*, and from the very alert member of their own species observed on August 30.

No light was thrown upon the function of the remarkable dilated tibiæ of the first legs of the male. The whole tibia, swollen into the shape of a pear, with the tarsus articulated to its broader end, presented a most curious appearance in the characteristic attitudes assumed during courtship. On the underside of this dilated mass, which is approximately circular in transverse section, two rows of hairs are seen. Although the hairs are smaller, and the rows more widely separated, both evidently correspond to those which are found beneath the unmodified tibiæ of the other legs.

Although we observed the habits of this species on many other occasions, neither F. Jenkinson nor I had ever seen the pairing accomplished. I therefore asked Mr. F. V. Dickins if he would consent to watch through

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a very hot afternoon. This he very kindly did, and although unsuccessful in this respect, he made many interesting observations which I give in his own words:—

"On the 4th September, 1895, I watched the courting habits of some grasshoppers on the knoll immediately behind the Weisshorn Hotel.

"At first I made my observations on the west slope, but there was a cool wind blowing, and the insects were neither numerous nor lively. Casting about I discovered on the south-east slope a particular hollow away from the wind, in the full glare of the sun, and focussing the heat-reflections from the hillock-slopes around it. Here the grasshoppers abounded and were very lively; I watched them for about two hours.

"I noticed that the males, marked by swellings on their first legs, were much more mobile than the females, the latter were mostly extremely passive and had to be chased and caught up by the males. There was a good deal of this chasing which was very amusing to watch. Sometimes the female, as if bothered, would remain quiet for a time and allow the male to come up to her. He appeared to stroke her with his antennæ, but I could not distinctly see what parts of her body he thus specially caressed. The insects never seemed to leap unless alarmed; I thought that perhaps leaping was not an ordinary mode of progression. I saw no male clasp or leap upon any female; they chased and chased, threw up the game, started a fresh pursuit, equally bootless, and so went on, tireless. I was not fortunate enough to see any *accouplement*. When the male was alongside the female, in many cases, the insect assumed a strained attitude, the anterior part of the body being raised high, and the terminal segments curved upwards so that the dorsal line was concave antero-posteriorly. Very often a curious little click was heard, I thought, usually as the chase ended in the pair suddenly standing still by each other. One might suppose that it was a chirp of triumph. I have no doubt it was made by the male.

"One rather curious situation in this active little drama is worth noting. A female alighted or rather ran up on my boot and sat quite still in the hot rays of the sun. She sat so still that the idea struck me I might try to caress her a little myself. I accordingly looked round for a slender flexible grass stem or dried haulm,

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and having found one gently touched her with the pliant extremity. She did not stir, and I became bolder; I rubbed her body on either side and also the inside of the coxæ and antennæ. She was still unmoved, except that a slight rigidity seemed to supervene, and the abdominal extremity curved slightly upwards. Gently tickling this part the curve rose and the rigidity seemed more marked. I now stroked her as gently as I could, and she permitted this extreme familiarity without resentment. Lastly, I took her softly up and laid her in the palm of my hand. Turning her from side to side she seemed quite content and did not exhibit a flutter or a tremor. I continued my caressings for ten minutes or a quarter of an hour, and then laid her in a warm spot and watched her for another quarter of an hour. She did not move, although she was alive enough. Was she hypnotized?"

This last interesting observation suggests that very marked effects may be produced by the patting which I witnessed on August 30th, and by the nibbling in the case of *Pezotettix*. In this latter species, indeed, the effect produced on a female after her first unsuccessful attempts to throw off the male, appeared to be very much like that induced by Mr. Dickins in the female of *Gomphocerus*.

Stethophyma fuscum.

This magnificent species was very abundant in the open grassy spaces between the trees at the water-courses some few hundred feet below the hotel, and also in certain places on the slopes far below the Bella Tola. The stridulation was far more characteristic than that of any other species observed: first three (sometimes two) strokes of the third legs across the tegmina, then a rapid vibration of the former against the latter for a few seconds. The result is three piercing sounds in rapid succession, and then a prolonged rustle. The rivalry between the males and their replies one to another were very evident, but their relations to the female were only witnessed once or twice.

August 31.—This species was observed by the water-courses. Many females were seen but never attended by males on this occasion. I came across a pair of males in the grass fighting in a very clumsy manner: they lay

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side by side, pushing and kicking at each other, and stridulating alternately. One male had lost one of the third pair of legs, perhaps in an earlier part of the fight, but if so it must have been somewhere else, as I searched for the leg in vain. In spite of its mutilation it replied with its single leg to every stridulation made by the other, and these replies seemed especially irritating to the uninjured male for it kicked more vigorously than ever, and once made a determined but unsuccessful effort to bite the end of the other's abdomen. The fight was already raging when I began to observe. After I had watched it for several minutes the uninjured male gave up and went away. It is possible that the fight may have begun by one male leaping on the other in mistake for a female, but it is more likely that it arose in a quarrel over one female. This view derives some support from the following observation.

September 2.—At a certain spot on the slopes below the Bella Tola the species was very common, and several pairs were seen in coitu. The female is larger and duller in colour than the males, and her wings are much smaller and probably useless for flight.

In the case of one pair in which copulation had evidently only just taken place, the female was seen to expel fæces: another male was lying beside the pair evidently trying to copulate with the female, continually stretching his abdomen towards her with partial eversion of the organs. He also stridulated from time to time, and I feel almost sure, although I cannot speak with certainty on this point, that the copulating male replied on each occasion. In a few minutes the unsuccessful male went away. I have suggested that the fight may have begun in some such contest, but probably before either male had succeeded in pairing. I cannot now remember whether the stridulation during the fight and on the occasion last described was similar to that which is characteristic of the species at other times. I am confident that no new sound was introduced, but cannot be sure as to whether both movements were made with their usual relation to each other.

September 7.—F. Jenkinson saw two males of this species drawn together from a distance of several yards apparently as the result of stridulating alternately. When at length they met, they seemed much excited,

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but soon separated without fighting. Perhaps the fight which I witnessed may have begun in this way.

STENOBOTHRUS (?) ELEGANS.

A beautiful little species which Dr. Sharp doubtfully identifies as *Stenobothrus elegans*, was often seen, although not abundant, below the hotel. The males in stridulating, do not, like the two last mentioned species, move the third legs symmetrically, but one follows the other. Probably in consequence of this the sound swells and diminishes rhythmically, presenting a remarkable likeness to that made by a fly caught in a spider's web. Considering its very small volume, this high and piercing sound can be heard for a great distance.

STENOBOTHRUS HÆMORRHOIDALIS.

After I left, F. Jenkinson observed a very small kind which is almost certainly to be identified as the above named species. Mr. Jenkinson has kindly given me the following notes:—

"SEPTEMBER 5.—About 5 p.m. I found a very small brown male, with the dorsal surface of the abdomen of a reddish-orange colour. He was very assiduous in his attentions to a green female with white V-shaped marks on the side of the thorax. He generally kept close to her, but was never obtrusive in his attentions, relying apparently on the effect of his stridulation. This was made with both legs simultaneously, generally very low, but sometimes louder, a rapid uniform trill, rather like the note of the lesser whitethroat. Sometimes she gave him the slip, and they were as much as eight inches apart, and out of sight of each other; but he continued at short intervals his stridulation, and somehow, *apparently* by accident, they came across each other again, and the male posted himself in close attendance as before. The female was generally nibbling at blades of grass. If the male touched her, she seemed to repel him by raising one of the third pair of legs. At 6·45 the sun was setting, and I had to go, so I boxed them both. The male was perhaps just beginning to relax his energy.

"SEPTEMBER 7.—Below Weisshorn Hotel. A male was stridulating and following a female, and was more

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successful in finding her again than any other species I have observed. At 5·30 the male jumped on the posterior part of the female's body, his legs round her tegmina. In this position he continued to stridulate although at rare intervals (he did so at 5·50). The female carrying the male shifted backwards moving her abdomen. She seemed to have some difficulty in expelling fæces, and this was apparently the cause of the movement. The male stridulated, and then at 6·0, without having copulated, he quitted the female, stridulated, and went away."

Psophus stridulus.

The large black males were common just below the hotel, and on some slopes below the Bella Tola, where *Stethophyma fuscum* abounded. Their red under wings were very conspicuous when flying, the characteristic rattling sound still further attracting attention to them. The larger brown, toad-like females, with smaller wings, are probably unable to fly.

I never saw the sexes together; but after I had left, F. Jenkinson kindly sent me the following notes:—

"September 5.—When the male finds himself near a female, he utters a double 'twitter' (once a twitter and then a trill), and moves excitedly. In one case I saw him leap on the back of a female, but presently he left her of his own accord.

"At 3 p.m. I came across a pair in coitu, but the male disengaged himself by vigorous movements of the third legs. They remained for a long time within two inches of each other, but nothing happened. I made the female jump away, caught her, and put her in the male's way. He at once became excited, and twittered, but the female escaped. This occurred more than once, when I lost her.

"A male, disturbed as I came home (about 6·45 p.m., when the sun was setting), hopped vigorously, but did not open his wings." This latter observation is of interest, because the males always took to flight, when disturbed, on other occasions.

"September 7.—On placing the female near the male, he became excited, and made a twittering sound with his legs. The female, in moving off, showed the red

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under wings, but even in the open path, the male seemed to lose her at once. In another case, when the female came near, the male jumped right away."

It is noteworthy that most of the observations upon the last-named two species were made late in the afternoon, when the sun was losing its power.

Œdipoda cœrulescens.

I had long wished to study the courtship of these beautiful insects, but there were none round the Weisshorn Hotel. Lower, at San Luc (5390 feet), they began to appear, and still lower, at Vissoye (4006 feet), and all along the main valley road, they were excessively abundant. They are always difficult to observe, because they haunt places where the combination of direct heat with that reflected from rocks or bare slopes, is almost unbearable. I had no time to observe them until we had come down to Fribourg.

September 9.—These insects were very abundant in a large gravel pit, just outside the gate of the town, on the road to La Roche. There is little doubt that they belonged to the above-named species. They were very lively, continually flitting about over the bare earth and gravel. They are very shy, and it is necessary to keep perfectly still in the intolerable heat, in order to watch their habits. I noticed that the males move their third legs as if in stridulation, but that no audible sound was emitted. There is an apparent lack of intention and effort about their movement which suggested that the habit is probably only a vestige, and possesses no other significance. The legs were raised, and seemed to be allowed to drop by their own weight. Furthermore, these strokes were not repeated at regular intervals, but quite irregularly, and often singly. In this case I did not secure any material, and therefore cannot speak with any confidence; but I anticipate that the legs will be found to be without the sound-producing structures.

A female remained motionless on the ground near to me. She was much larger than the males, and the exposed surface of her body and wings was of a redder brown. The males were extremely acute in detecting her presence, although she made no movement, and looked exactly like a part of the ground. Whenever a

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male perceived her, he instantly approached without any preliminary courtship, leaped upon her back, remained a few seconds, and then voluntarily left her. The female did not make any apparent movement, although I saw quite half-a-dozen males leap upon her in the course of a few minutes. The males never met near her, and I saw no signs of any fighting. I could not tell whether there was any actual pairing, but it is improbable that this could have occurred in so short a time. It is likely that the males found that she was in some way unfit for pairing, and then left her. I have already implied that there was no special display of the beautiful blue under wings for the benefit of the female.

I trust that I may be able to make further observations upon these beautiful and interesting insects at some later date.

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Explanation of Plate I.

Fig. 1. *Diplosis* species, wing.
2. " species, "
3. *Winertzia* species, wing.
4. *Miastor* species, wing, & part of antenna.
5. *Harmosa* species, wing.
6. *Trichopterygia nodosa*, wing, & antenna, & part of
7. *Micromera* species, wing.
9. *Platyura apicalis*, wing.
10. " *pectinatus*, wing.
11. " *incrassatus*, wing.
12. *Cecidomyia anthracina*, wing.
13. *Xeroglaphyroptera nigra*, wing.
14. *Mamaia lefecta*.
15. *Probolaria sagittaria*, wing, 15a head, 15b mouth-parts
15c hypopygium.
16. *Xenisphera succipennis*, wing.
17. *Sciophila lineata*, wing.
18. *Phthinia truncicola*, wing.
19. *Mycetophila nasuta*, wing.
20. " *nubilosa*, wing.
21. *Sciara permixta*, wing.
22. " *debilis*, wing.
23. " *zygoneura*, wing.
24. *Zygoneura exulans*, wing, 24a part of antenna.
25. *Simulium ursinum*, wing, 25a ♂ front tarsus.
26. *Scatopse nigrinea*, wing.
27. *Psilozoma chiuari*, wing, 27a hypopygium, 27b head of ♂.
28. *Megaselenia portoricensis*, head of ♂. 28a wing.
29. *Ceratopogon* species, antenna, 29a hypopygium.
30. *Ceratopogon pertinens*, antenna.
" *perturbans*, ♀ head.

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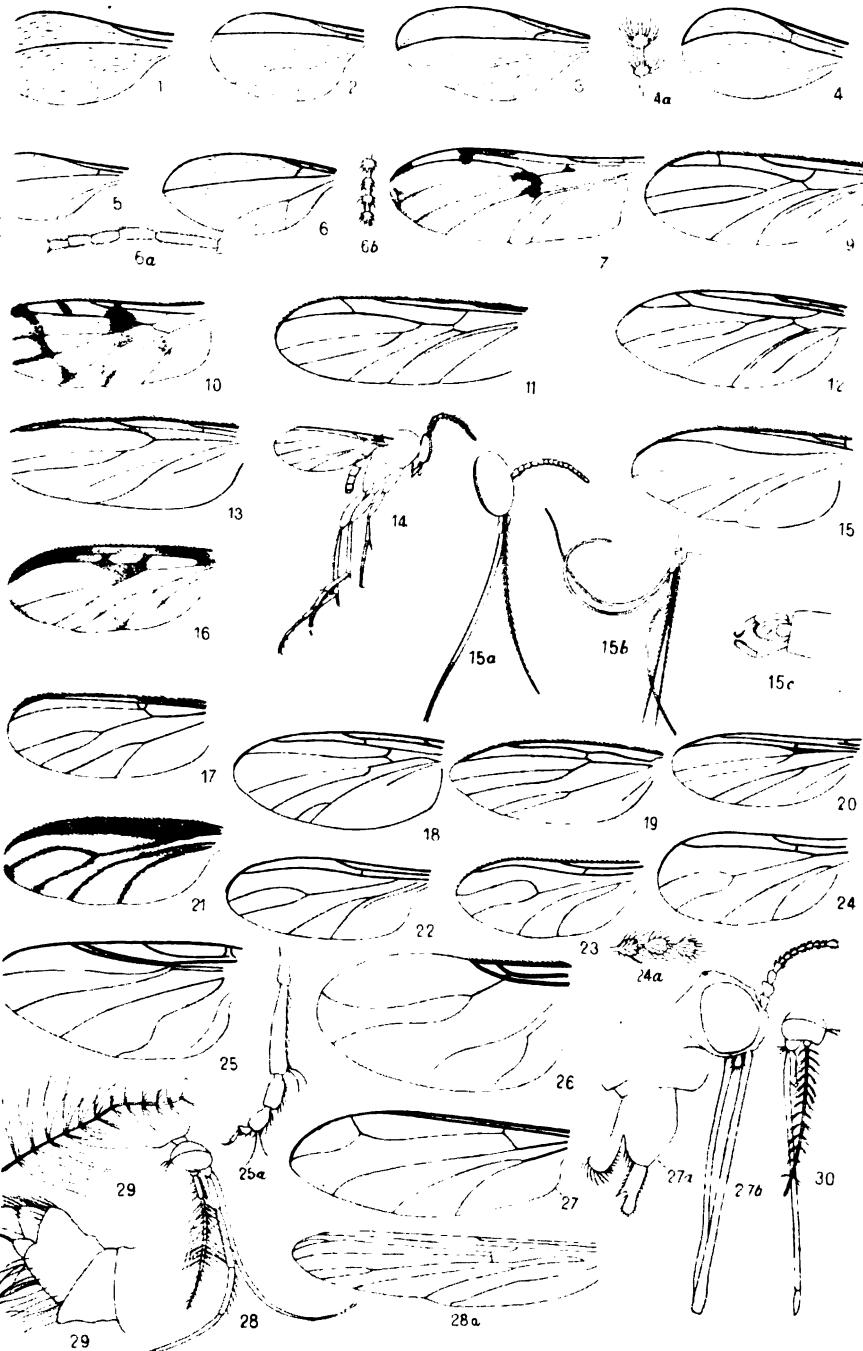

Edwin Wilson Camb

WEST INDIAN DIPTERA.

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XI. *On the Diptera of St. Vincent (West Indies).* By Professor Samuel Wendell Williston. (*Dolichopodidæ* and *Phoridæ*, by Professor J. M. Aldrich.) Communicated by David Sharp, M.A., F.R.S, on behalf of the Committee for investigating the Flora and Fauna of the West Indies.

[Read March 4th, 1896.]

Plates VIII., IX., X., XI., XII., XIII. and XIV.

[This paper is a list, accompanied with descriptions, of the Diptera found in the island of St. Vincent, by Mr. H. H. Smith, the well-known American entomologist, who was sent to the islands by F. D. Godman, Esq., F.R.S., to assist the Committee in its investigations. Some general remarks by the Author will be found at the end of the paper. A second memoir, treating of the Diptera of the neighbouring island of Grenada, will, it is hoped, be almost immediately ready for publication, the present instalment having been in the hands of the Committee for upwards of two years.—D. S.]

CECIDOMYIIDÆ.

Diplosis.

Loew, Dipt. Beitr., iv., 20, 1850.

1. *Diplosis pictipes*, n. sp.

♂. Face yellow. Antennæ as long as the wings, yellow, the joints alternately double, with their petioles as long as the thickened portion. Mesonotum opaque red; two slender stripes and the middle portion behind yellow. Abdomen reddish-yellow. Legs black; the distal two-fifths of the front femora, the immediate tip of the hind femora, the tip of the hind tibiæ; a broad ring on the second, third, and fourth joints of all the tarsi, and the terminal portion of the fifth joint, light yellow. Wings with black hair, forming irregular markings; third vein gently curved, terminating just beyond the tip of the wing. Length 1½ mm.

Four specimens.

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2. *Diplosis*, sp. (Pl. VIII., fig. 1, wing.)

♂. Antennæ about as long as the wings; all the joints single, the petioles a little shorter than the thickened portion. Yellow, the mesonotum somewhat brownish, the abdomen, tibiæ, and tarsi infuscated. Wings nearly hyaline, black haired. Length 1½ mm.

3. *Diplosis*, sp.

♂. Very much like the preceding species, but with each alternate joint of the antennæ double.

4. ? *Diplosis*, sp. (Pl. VIII., fig. 2, wing.)

Two specimens, with the antennæ incomplete, I refer doubtfully to this genus. The antennæ are not petiolated, and resemble those of *Asphondylia*, but have the joints provided with long hairs, as in this genus.

WINNERTZIA.

Rondani, Dipt. Ital. Prodri, 1856.

1. *Winnertzia*, sp. (Pl. VIII., fig. 3, wing.)

Two specimens, male and female; both injured.

MIASTOR.

Meinert, Natur. Tijdschr., 3 R., iii., 156, 1864.

1. *Miastor*, sp. (Pl. VIII., figs. 4, wing; and 4*a*, part of antenna.)

A single specimen of a species which seems to present all the essential characters of this genus. The wings have the first and third veins distinct, but lack the posterior forked cell. The legs are short and not slender. The tibiæ are as long as the first two joints of the tarsi together, and the first joint is a half longer than the second.

HAPLUSIA.

Karsch, Revision der Gallmücken, p. 15, 1878.

1. *Haplusia*, sp. (Pl. VIII., fig. 5, wing.)

A single specimen of a minute species shows evident relationship to this genus, though I am not fully satisfied that it should be located in it.

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The neuration is very nearly the same as that of the type species (comp. Karsch, *l. c.*, fig. 1). The first joint of the tarsi is about one-third of the length of the second joint, which is as long as all the other joints together. The fifth joint is widened, somewhat disk-like, and is as long as the preceding joint. The head is wanting. The colour of the remainder of the insect is light yellow, with the mesonotum brown. Length about ½ mm.

Trichopteromyia, n. g.

Allied to *Diomyza* (in Schiner's sense), but the first and third longitudinal veins are not crowded together anteriorly, the third vein terminating at the tip of the wing. Wings broad, very hairy; proximal section of the third vein straight, the distal section nearly straight; prefurca of forked cell scarcely longer than the sixth vein. Antennæ with the joints distinctly petiolate; the distal portion of the antennæ in both specimens is wanting. Metatarsi longer than the following two joints together.

The genus *Diomyza* is, as yet, not well known, and I do not feel quite sure of its distinctive characters. As Schiner defines it, it differs from *Lasioptera* only in the elongate metatarsi. However, there has been much confusion in the application of the name *Diomyza*, as Karsch has shown (Revision der Gallmücken, p. 13), and it may be that the name will have to be abandoned. The present genus seems to be the only other one known with elongate metatarsi, in which the fifth vein is forked.

1. *Trichopteromyia modesta*, n. sp. (Pl. VIII., figs. 6, wing; 6*a*, tarsus; 6*b*, part of antenna.)

♀. Reddish-yellow, opaque; the pleuræ, venter, and legs yellow; the front and tip of abdomen blackish, the metanotum brownish. Antennæ brownish-yellow, with black hair. Wings hyaline beneath the dense blackish hair. Length nearly 2 mm.

Two specimens.

MYCETOPHILIDÆ.

Macrocera.

Meigen, Illiger's Mag., ii., 261, 1803.

1. *Macrocera concinna*, n. sp. (Pl. VIII., fig. 7, wing.)

♂, ♀. Yellow. Mesonotum with three brown stripes; wings cinereous, with a large central brown spot, a spot at the tip of the thickened first vein, the tip of the wing and a small cuneate spot

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in the first basal cell. Length 4–5 mm.; of the antennæ, male, 16 mm.; female, 7 mm.

♂. Head light yellow, the ocelli black. Antennæ about four times the length of the body; brownish, toward the base brownish-yellow. Palpi brown. Mesonotum yellow, with three brown stripes, the middle one extending to the collar, the lateral ones abbreviated in front and turned downwards to connect with a vertical brown stripe on the pleuræ. Pleuræ light yellow, with a brown spot in front of the halteres, in addition to the vertical stripe, which extends to the middle coxæ. Scutellum and metanotum brown. Abdomen yellow, the proximal segments somewhat infuscated toward their base; hair black. Legs light yellow; tarsi infuscated; front tibiæ suddenly dilated at their tip. Wings cinereous hyaline; a dark brown spot at the junction of the third and fourth veins, extending back to the angle of the posterior basal cross-vein; a similarly coloured spot at the tip of the first vein, reaching across the third longitudinal vein; the tip of the wing is broadly brownish, and there is a small brown spot in front of the fourth vein, opposite the tip of the auxiliary vein; anterior cells yellowish; anterior branch of the third vein oblique and pallid.

♀. In the single female specimen, the colour is more reddish-yellow, the abdomen is red with the posterior margin of the segments yellow. Antennæ only about twice the length of the body.

Seven specimens. Sea level, and 1000 feet. This species seems to be related to *M. inconcinna*, Loew, but differs especially in the markings of the thorax.

Platyura.

Meigen, Illiger's Mag., ii., 264, 1803.

Table of Species.

1. The anterior branch of the third vein terminates in the first longitudinal vein . . . . . *parva*, n. sp.
   The anterior branch of the third longitudinal vein terminates in the costa beyond the end of the first vein . 2
2. Wings with brown spots. . . . . *pictipennis*, n. sp.
   Wings uniformly infuscated 3
3. Auxiliary vein very short . . . . . *ignobilis*, n. sp.
   The auxiliary vein terminates opposite the origin of the third longitudinal vein . . . . . *fusciventris*, n. sp.

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1. *Platyura parva*, n. sp.

♂. Antennæ brownish-yellow, shorter than the thorax. Posterior part of the mesonotum, the narrow lateral margins, and three slender stripes, brown or black; elsewhere the thorax is yellow, save two spots on the pleuræ, and the metanotum for the greater part, which are black. Abdomen cylindrical, black, the venter and immediate base yellowish. Coxæ and legs yellow; the terminal portion of the tibiæ, and the tarsi, brownish; metatarsi about three-fourths of the length of the tibiæ; all the tibiæ with a single spur and without spines. Wings lightly tinged; the anterior branch of the third vein terminates in the first vein near its tip. Length 2½–3 mm.

Two specimens.

2. *Platyura ignobilis*, n. sp. (Pl. VIII., fig. 9, wing.)

♂. Base of antennæ and the face yellow; front and occiput blackish. Thorax reddish-yellow, the dorsum with black hair arranged in distinct rows. Scutellum and metanotum brownish. Abdomen brownish-yellow, with black hair. Legs yellow, the tarsi infuscated; front metatarsi not more than three-fourths the length of the tibiæ. Wings uniformly subinfuscated; the anterior branch of the third vein is nearly rectangular, terminating in the costa. Length 3–4 mm.

3. *Platyura pictipennis*, n. sp. (Pl. VIII., fig. 10, wing.)

♂, ♀. Front and face yellowish or brownish, the palpi darker coloured. Antennæ brownish, about as long as the thorax, moderately compressed. Thorax yellow; the dorsum, save a yellowish spot or stripe in the middle, and the yellow lateral margins, brown or black; disk and sides of the metanotum brown. Abdomen brown or blackish-brown, the posterior margin of each segment yellow. Legs, including the coxæ, yellow, the distal portion of the tibiæ, and the tarsi, brownish; tibiæ without spines; front tibiæ and metatarsi of nearly equal length, the hind metatarsi shorter than their tibiæ; all the tibiæ with a single spur. Wings nearly hyaline, with markings as follows: a large brown spot, reaching from the costa to the fifth vein, over the prefurca; another of about the same size in the outer part of the first posterior cell; and smaller ones in all the cells on the posterior side of the wing; the anterior branch of the third vein runs into the costa a little beyond the tip of the first vein. Length 3–3½ mm.

Six specimens.

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4. *Platyura fasciventris*, n. sp. (Pl. VIII., fig. 11, wing.)

♀. Head and basal joints of the antennæ reddish-yellow, the distal joints of the antennæ black or brownish-black; the oval ocellar spot black. Front broad, the orbits emarginate. Thorax reddish-yellow; the dorsum red, with four brown stripes, sometimes feebly marked or obsolete. Abdomen red, or reddish-yellow, with a black band of variable width at the posterior part of each segment; venter yellow. Coxæ and femora light yellow; tibiæ yellow, the tarsi brownish; tibiæ without spines; metatarsi about as long as their tibiæ; all the tibiæ with a single terminal spur. Wings uniformly brownish; anterior branch of the third vein oblique, terminating in the costa. Length 5–6 mm.

Three specimens. The antennæ are about as long as the dorsum of the thorax.

Ceroplatus.

Bosc., Actes de la Soc. d'Hist. Nat. de Paris, i., 1, 42, 1792.

1. *Ceroplatus longimanus*, n. sp. (Pl. VIII., fig. 12, wing.)

♂. Mesonotum with yellow and black stripes. Abdomen black, with yellow lateral spots. Length 6 mm.

Face yellow, very narrow. Palpi and first two joints of the antennæ yellow; remainder of the antennæ dark brown. Antennæ about as long as the dorsum of the thorax. Front narrow, the sides gently convex, black, except on the lowermost portion; the two large ocelli about equidistant from each other and from the margins of the eyes. Occiput black. Thorax yellow; the dorsum with three broad black stripes, enclosing two narrow yellow stripes, which are convergent posteriorly; the median stripe enclosing a slender yellow stripe, which does not reach beyond the middle; a large rounded spot on the mesopleuræ, another below it on the mesosternum, and the sides of the metanotum, dark brown or black, the middle of the metanotum brownish; scutellum brown. Abdomen slender, cylindrical, dark brown; each segment, save the first and last, with an elongate yellow spot on each side, reaching two-thirds of the way to the hind margin; genital organs yellow. Coxæ light yellow, the hind pair with a brown spot; femora yellow, the base of the middle and hind pairs brown; tibiæ yellowish-brown; tarsi brown; no bristles on the front femora; front metatarsi about two and a-half times

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the length of the tibiæ; middle metatarsi a fourth or a third longer than the tibiæ; the hind pair scarcely longer; hind tibiæ with two spurs. Wings tinged with brownish; the anterior branch of the third vein runs into the costa.

One specimen. "Cliff over mountain stream, under overhanging rock, Sept. 1000 feet."—H. H. Smith.

Neoglaphyroptera.

Osten Sacken, Cat. Dipt., p. 10, 1878, vice *Glaphyroptera*, Winnertz, Pilzmücken, 145 (781), 1863 (preoc.).

1. *Neoglaphyroptera nitens*, n. sp. (Pl. VIII., fig. 13, wing.)

♂, ♀. Mesonotum shining black; wings infuscated. Length 4 mm.

Front black or blackish, yellow on the lower part. Face yellow. Antennæ blackish, the basal joints yellowish, about as long as the thorax. Mesonotum, scutellum, and metanotum shining black, the bristles of the same colour. Pleuræ yellow in front; reddish-brown behind. Abdomen slender; shining black or deep brown, the proximal segments in front yellow or yellowish; venter yellow. Tuberculum of halteres black. Coxæ yellow; femora nearly of the same colour; hind femora at the tip blackish; tibiæ brownish-yellow; tarsi brown; front tibiæ shorter than the metatarsi; middle tarsi nearly a half longer than their tibiæ; hind tibiæ and tarsi of nearly equal length. Wings infuscated, the apex tinged with blackish; a brown spot at the origin of the cross-vein. Middle and hind tibiæ with stout spurs.

Six specimens. 1000–1500 feet. In some of the specimens the face is brown, the front wholly black, the posterior part of the pleuræ black, and the abdomen, for the greater part, of the same colour. The species must be nearly related to *N. ventralis*, Say, but the infuscated wings and the absence of a distinct terminal fascia, seem ample to distinguish them.

2. *Neoglaphyroptera concinna*, n. sp.

♀. Mesonotum reddish-yellow. Length 4 mm.

Antennæ about as long as the thorax, brown or blackish, the basal joints yellow. Front and face, like the thorax, reddish-yellow. Bristles and very short hair of the thorax black. Abdo-

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men reddish-yellow; each segment with a large, subtriangular, black spot, the base directed posteriorly and the apex reaching nearly or quite to the anterior margin; last segment wholly black. Legs yellow, the tarsi brownish; front metatarsi longer than the tibiæ; middle tarsi a third longer than the tibiæ; hind tarsi of about the same length as the tibiæ. Wings tinged with brownish; an indistinct band across the outer part, and a similar spot at the base of the anterior forked cell.

Four specimens.

Manota, n. g.

Head flattened, placed rather high as regards the thorax; face and front broad, the antennæ situated high up, directed upwards and forwards; composed of sixteen joints closely united, the basal joints a little differentiated from those of the flagellum. Three ocelli of nearly equal size, situated near the vertex, in a gently curved line, the lateral ones about as far from the inner borders of the eyes as from the middle one. Palpi composed of three joints, elongate, the terminal joint slender and directed angularly backwards. Dorsum of thorax moderately convex; scutellum with short bristles. Abdomen slender, flattened cylindrical. Femora stout, flattened; front and middle tibiæ with one, the hind tibiæ with two spurs; hind tibiæ and metatarsi with a row of short bristles on the outer side; all the tibiæ without long bristles; coxæ elongate. Wings longer than the abdomen; auxiliary vein rudimentary; the first vein terminates before the middle of the wing; third vein not furcate; fourth vein wanting, save the distal portion of its branches; fifth vein furcate near the basal portion of the wing; the costa extends a considerable distance beyond the termination of the third vein.

As in the following genus, the proximal portion of the two outer veins is so wholly obliterated that it is impossible to trace them.

1. *Manota defecta*, n. sp. (Pl. VIII., fig. 14.)

♂. Antennæ brown, densely pubescent, reaching nearly to the middle of the abdomen if bent backward. Face and front brownish-yellow. Mesonotum reddish or yellowish-brown, finely white pubescent. Pleuræ a little lighter coloured. Coxæ and femora light yellow, the middle coxæ near the upper part with a

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small, oval, black spot; tibiæ yellow. the tarsi more brownish. Abdomen brown or blackish above. Wings tinged with brownish. Length 2–2½ mm.

Six specimens.

Probolæus, n. g.

Proboscis more than half of the length of the body, slender, directed downwards and forwards, composed of five slender bristles; palpi wanting. Antennæ sixteen-jointed, compressed, the joints closely set together; first two joints only a little differentiated from the others. Head composed almost wholly of the eyes; face very narrow; front narrow below; eyes pubescent. Thorax strongly convex, nearly bare, a few short bristles on the sides. Scutellum small, with about six small bristles. Abdomen slender, elongate, longer than the wings; male organs composed of a pair of simple, fleshy forceps. Four anterior legs very slender; hind legs stouter and much elongate, the femora thickened, and the tibiæ clubbed. Neuration defective; third vein entirely separated from the first, and without anterior branch; proximal portion of the fourth and fifth veins wholly invisible; sixth vein complete. The costa reaches a considerable distance beyond the tip of the third vein.

This genus is remarkable in the apparently entire absence of the palpi. The closest examination of our three specimens has failed to reveal any trace of them. The labium, or sheath for the other mouth-parts, is quite rudimentary. In the wings there is not the faintest trace of the proximal portions of the fourth and fifth veins; those portions that are present are by no means weak. An equally minute examination fails to show the ocelli, though I will not be positive that they are not present. The presence of tibial spurs, the moderately elongate coxæ, and the general relationship to other species of the family, especially *Gnoriste*, seem to prove the correct location of the genus here.

1. *Probolæus singularis*, n. sp. (Pl. VIII., figs. 15, wing; 15*a*, head; 15*b*, mouth-parts; 15*c*, hypopygium.)

♂. Front, face and occiput black. Antennæ brown, the basal joints somewhat yellowish. Mesonotum opaque deep reddish-brown, the humeri and postalar callosities yellowish. Pleuræ brown or yellowish-brown, shining. Abdomen black, the first

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segment and a posterior band on the second, third and fourth segments yellow. Halteres yellow. Wings nearly hyaline, lightly clouded on the outer part. Legs, including coxæ, light yellow; the tarsi and the thickened portion of the hind tibiæ infuscated or blackish. Length 4–5 mm.

Three specimens. "Forest, 1800 feet, west slope of Sonfriere, Sept. 23."—H. H. Smith.

Neoëmpheria.

Osten Sacken, Cat. Dipt., 1878, p. 9, vice *Empheria*, Winnertz, Pilzm., 102 (738), 1863 (preoc.).

1. *Neoëmpheria maculipennis*, n. sp. (Pl. VIII., fig. 16, wing.)

♂. Wings with brown markings; anterior branch of third vein situated a little beyond the furcation of the fourth vein. Length 5 mm.

Antennæ about as long as the head and thorax together; the basal joints light yellow, the remainder with a brownish tinge. Palpi brown; front and face yellow; mesonotum, except the lateral margins, light brown, with black hair and bristles; indistinctly striped; moderately shining. Pleuræ, coxæ and femora light yellow. Scutellum, except at its base, light yellow, and with two bristles on its margin. Abdomen light yellow, each segment with a large black or brown spot, not reaching the hind margin. Tibiæ and tarsi yellow, but appearing blackish from the abundant, short, black hair; front tarsi more than twice the length of their tibiæ. Wings nearly hyaline, with the following markings: the tip of the subcostal cell and the submarginal cell beyond the anterior branch of the third vein, and the proximal end of the first posterior cell, brown; a more distinct brown spot clouding the costal cross-vein, the basal section of the third vein, the base of the first posterior cell, and, more diffusely, along the posterior branch of the fourth vein, to connect with a spot running from the first posterior cell into the hindmost posterior cell; a smaller brownish spot in the axillary angle; costal and subcostal cells yellowish; costa produced beyond the tip of the third vein; anterior branch of the third vein situated a little beyond the furcation of the fourth vein.

Four specimens. 1000 feet.

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Sciophila.

Meigen, Syst. Beschr., i., 245, 1818.

1. *Sciophila diluta*, n. sp. (Pl. VIII., fig. 17, wing.)

♂. Reddish yellow; abdomen brown. Length 3 mm.

Antennæ about as long as the head and thorax together, somewhat compressed; light brown, the basal joints yellow. Front and face brown or brownish-yellow, palpi brown. Thorax, coxæ and femora reddish or luteous yellow; mesonotum brownish-yellow, with black hair and bristles. Abdomen brown or yellowish-brown, with black hairs. Tibiæ brown; tarsi blackish; front metatarsi a trifle shorter than their tibiæ; hind tarsi scarcely longer than the tibiæ. Wings tinged with brownish; the costal vein terminates at the tip of the third vein; first submarginal cell very short; furcation of the fifth vein very nearly opposite the origin of the third vein.

Two specimens.

Phthinia.

Winnertz, Pilzmücken, 143 (779), 1863.

1. *Phthinia fraudulenta*, n. sp. (Pl. VIII., fig. 18, wing.)

♂. Brown or blackish and luteous; wings hairy; the auxiliary, first and third veins with distinct, short, bristly hairs. Length 2½–3 mm.

Antennæ brown or blackish, the basal joints somewhat yellowish; the joints of the flagellum closely set together, somewhat compressed. Front and face black or brownish-black. Mesonotum reddish-brown, shining, with black hair; pleuræ and coxæ yellow. Abdomen reddish-brown or blackish, black at the tip; venter yellow. Legs yellow, the tarsi brownish, becoming black at the tip; spurs of tibiæ stout; hind tibiæ with two rows of spines; front metatarsi distinctly shorter than their tibiæ; hind tarsi longer than their tibiæ. Wings tinged with blackish, due to the easily perceptible pubescence.

Two specimens.

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Mycetophila.

Meigen, Illiger's Mag., ii., 263, 1803.

Table of Species.

1. Vein between the outer part of the first basal cell and the second basal cell thickened . . . . . *nodulosa*, n. sp.
   Vein at outer part of first basal cell not thickened. . . . 2
2. Hind metatarsi distinctly shorter than the remaining joints together . . . . . *insipiens*, n. sp.
   Hind metatarsi about as long as the following joints together . . . . . *dolosa*, n. sp.

1. *Mycetophila insipiens*, n. sp. (Pl. VIII., fig. 19, wing.)

♀. Antennæ about as long as the thorax, yellow; brownish toward the end. Front and face yellow. Mesonotum yellowish-red. Abdomen reddish-yellow; each segment broadly brown on its posterior part. Legs, including the coxæ, light yellow; front tibiæ about one-third of the length of the tarsi, and shorter than the metatarsi; middle tibiæ with two large and one small bristles on the inner side; middle and hind tibiæ with spines on the outer side; hind metatarsi distinctly shorter than the remaining joints of the tarsi together. Wings tinged with yellowish; a small brownish cloud on the basal section of the third vein. Length 2½ mm.

Six specimens.

2. *Mycetophila dolosa*, n. sp.

♂. Antennæ brown, somewhat compressed, the basal joints yellowish. Front and face brown. Mesonotum dark brown, opaque, with a thin yellowish sheen in some reflections. Abdomen dark brown or black, the venter yellow Pleuræ yellowish-brown. Coxæ and legs light yellow, the tarsi appearing blackish from the hair; front tibiæ less than half of the length of the tarsi, and a little longer than the metatarsi; hind tibiæ with two rows of spines on the outer side; middle tibiæ with spines on the inner side; hind metatarsi nearly as long as the following joints together. Wings tinged with brownish. Length 2½–3 mm.

3. *Mycetophila nodulosa*, n. sp. (Pl. VIII., fig. 20, wing.)

♂. Antennæ brownish-yellow, the basal joints yellow; longer than the head and thorax together. Front and face light

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ochraceous yellow. Palpi brown. Mesonotum light ochraceous yellow, lightly white pruinose on the sides, and with blackish and yellow hair. Pleuræ brownish-yellow. Abdomen reddish-brown; pubescence chiefly black. Legs yellow, the coxæ and femora light yellow, the broad hind femora at the tip brown. Front tibiæ about one-third of the length of the tarsi, and shorter than the metatarsi; middle tibiæ with spines on the inner side; hind tibiæ with two rows of spines on the outer side. Wings lightly tinged; the outer part of the first section of the fourth vein, the anterior cross-vein, and the base of the second of the third vein, thickened, forming a straight spindle-shaped mass. Length 2½ mm.

Six specimens.

Sciara.

Meigen, Illiger's Mag., ii., 263, 1803.

Table of Species.

1. First longitudinal vein reaching as far as the furcation of the fourth vein 2
   First longitudinal vein not reaching as far as the furcation of fourth vein. 4
2. Insertion of third longitudinal vein nearer to the tip of the wing than is the tip of the posterior branch of the fourth vein . . . . . *germana*, n. sp.
   Insertion of the third and the posterior branch of the fourth vein equidistant from the tip of the wing . . 3
3. Black species . . . . . *concinna*, n. sp.
   Yellow species . . . . . sp. (5).
4. Furcation of the fifth and sixth veins beyond the anterior end of the cross-vein, the angle very acute, the prefurca more than one-half of the length of the sixth vein 5
   Furcation of fifth and sixth veins opposite or before the origin of the cross-vein, less acute, the prefurca less than one-half the length of the sixth vein. 6
5. Mesonotum shining black . . . . . *debilis*, n. sp.
   Mesonotum yellow and brown . . . . . *delectata*, n. sp.
6. Anterior branch of the anterior furcation strongly curved forward in its basal portion. . . . . *zygoneura*, n. sp.
   Anterior branch of the usual form 7
7. Yellow or yellowish-red species . . . . . sp.
   Black species . . . . . *equalis*, n. sp.

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1. *Sciara germana*, n. sp. (Pl. VIII., fig. 21, wing.)

♂, ♀. Head black, opaque, thinly greyish dusted. Antennæ black, with white pubescence; first joint of the flagellum somewhat yellowish. Thorax and halteres black; mesonotum moderately shining, with three rows of short black bristles; pleuræ whitish dusted. Abdomen black or deep brown, venter on the sides yellow or red in the female; male forceps large. Legs pitchy black. Wings blackish in front and along the veins, the cells posteriorly subhyaline. The first vein reaches a little beyond the furcation of the fourth vein; the third vein reaches nearly to the tip of the wing. Length 5–7 mm.

Numerous specimens. It is possible that this is the same as *S. nigra*, Wiedemann, but the description is too brief to afford any certainty that such is the case. It is evidently closely related to *S. thomæ*, of Europe. The origin of the third vein is a little before the middle of the first vein.

2. *Sciara concinna*, n. sp.

♀. Front below the eyes and the face, brownish-red; vertex and occiput black, somewhat shining. Antennæ black, shorter than the abdomen; basal joints yellowish; proximal joints of the flagellum with black pubescence, that of the distal joints whitish. Thorax black; humeri yellowish; mesonotum moderately shining. Abdomen black, with black hairs; venter yellow. Coxæ and femora yellow; tibiæ brownish; tarsi black. Wings uniformly smoky or blackish; origin of the third vein a little before the middle of the first, which reaches as far as the furcation of the fourth vein; prefurca of fourth vein distinctly longer than the anterior branch; tip of the third and of the posterior branch of the fourth veins equidistant from the tip of the wing. Length 2½-3 mm.

Numerous specimens. The male differs only in having the antennæ as long as the body.

3. *Sciara debilis*, n. sp. (Pl. VIII., fig. 22, wing.)

♂. Vertex shining black, with black hair; front and face reddish-brown; palpi yellow. Antennæ as long as the body, luteous yellow, but obscured by the black pubescence. Thorax light yellow, except the mesonotum and scutellum, which are shining black; humeri luteous. Abdomen black, with black hair; hypopygium yellowish. Coxæ and femora light yellow; tibiæ and tarsi brown. Wings smoky; the third vein arises from beyond the middle of the first vein, which does not reach as far as the furcation

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of the fourth ; tip of third and of the posterior branch of the fourth vein equidistant from the tip of the wing ; prefurca of fourth vein longer than its branches ; furcation of fifth vein beyond the origin of the anterior cross-vein, acute. Knob of halteres brown. Length 2½ mm.

Eight specimens.

4. *Sciara delectata,* n. sp.

♂. Antennæ black, with grey and black pubescence, the scape and first one or two joints of the flagellum yellow. Front and face brownish-yellow, the occiput yellow. Thorax yellow, the mesonotum with two elongated brown spots, and a median, less conspicuous brown stripe. Abdomen yellow ; each segment with a broad brown posterior band ; hypopygium large, light yellow, the forceps brownish. Legs light yellow, the tarsi infuscated. Wings nearly hyaline ; neuration nearly as in *S. debilis.* Length 2 mm.

Six specimens. Sea level, 1000.

5. *Sciara,* sp.

♀. Light yellow ; bristles and hair black, rather strong. Each segment of abdomen with a broad, posterior, dark-brown band. Tarsi infuscated. Wings nearly hyaline ; the first vein terminates nearly opposite, or a little before the furcation of the fourth vein ; the third takes its origin a little beyond the middle of the first vein ; tip of third and the posterior branch of the fourth vein nearly equidistant from the tip of the wing. Length 3 mm.

One specimen ; antennæ wanting.

6. *Sciara zygoneura,* n. sp. (Pl. VIII, fig. 23, wing.)

♂. Occiput and vertex shining black ; front below the eyes, and the face, opaque black. Scape and first three or four joints of the flagellum yellowish ; distal three joints white, with white pubescence ; remaining joints black, with black pubescence. Thorax black ; mesonotum shining, with two rows of short black bristles ; scutellum shining black, with bristles on its border. Venter and first two segments of the abdomen yellow ; remainder of abdomen black or deep brown with yellow incisures ; ovipositor black, lamellæ yellowish ; knob of the halteres brown. Legs yellow, including the coxæ ; terminal joints of the tarsi blackish ; the tarsi and tibiæ obscured by short black hairs. Wings lightly brownish ; origin of third vein near the outer fourth of first vein ;

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termination of first vein at some distance before the furcation of the fourth; prefurca of fourth vein about as long as the posterior branch; anterior branch strongly curved forward in its anterior portion, as in species of *Zygoneura*. Length 2 mm.

Eight specimens. There are not more than one or two joints of the flagellum which are yellow in some specimens; apparently, also the number of white joints at the tip may be limited to one. The humeri are sometimes red. The abdomen, when not drawn out, appears almost wholly black in some specimens.

Zygoneura.

Meigen, Syst. Beschr., vi., 304, 1830.

1. *Zygoneura sciastica*, n. sp. (Pl. VIII., figs. 24, wing; 24*a*, part of antenna.)

♂. Dark brown, or blackish brown, opaque. Antennæ as long as the body, its pubescence in some reflection grey. Legs luteous yellow; tibiæ infuscated; tarsi blackish. Wings nearly hyaline; neuration as in the figure. Length 1–1½ mm.

One specimen.

SIMULIIDÆ.

Simulium.

Latreille, Hist. Nat. Crust. et Ins., xiv., 294, 1804.

1. *Simulium tarsale*, n. sp. (Pl. VIII., figs. 25, wing; 25*a*, front tarsus of ♂.)

♀. Abdomen black, the proximal segments opaque, the distal four segments shining. Length 2 mm.

Front and face black, with a light grey reflection. Antennæ yellow; the distal joints somewhat brownish. Mesonotum deep black; in front, opaque with a silvery shimmer, and with sparse, short, curly, golden-yellow tomentum; behind, shining. Pleuræ black, whitish pruinose. Abdomen black, the basal segments opaque, the distal four segments somewhat shining, and with a delicate whitish pruinosity. Legs reddish-yellow; tarsi black, except that the proximal half of the middle and hind metatarsi light yellow; first and third joints of the front pair each with two long hairs; second and third joints of the same pair dilated, the

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Explanation of Plate IX.

Fig. 31. *Hæmagogus splendens*, ♀ head, 31*a* palpus, 31*b* ♂ claw, 31*c* wing.
32. *Chironomus spilopterus*, wing.
33. „ *longimanus*, wing.
34. *Orthocladius debilis*, wing.
35. *Tanypus indecisus*, wing.
36. *Ceratopogon maculithorax*, wing.
37. „ *pygmæus*, wing.
38. „ *venustulus*, wing, 38*a* front leg, 38*b* palpus.
39. „ *punctipennis*, wing.
40. „ *eriophorus*, tarsus, 40*a* antenna, 40*b* palpus.
41. „ *propinquus*, tarsus, 41*a* wing.
42. „ *flavus*, wing, 42*a* tarsus.
43. „ *longicornis*, wing, 43*a* antenna.
44. „ *thersites*, wing.
45. „ *decor*, wing.
46. „ *phlebotomus*, wing, 46*a* palpus.
47. „ *lotus*, wing.
48. „ *sequax*, wing.
49. *Psychoda alternata*, wing.
50. „ *pallens*, hypopygium, 50*a* wing.
51. „ *angustipennis*, wing.
52. *Pericoma albitarsis*, wing.
53. *Geranomyia pallida*, wing.
54. *Rhipidia bipectinata*, wing.
55. „ *unipectinata*, antenna.
56. „ *costalis*, antenna.
57. „ *subpectinata*, wing.

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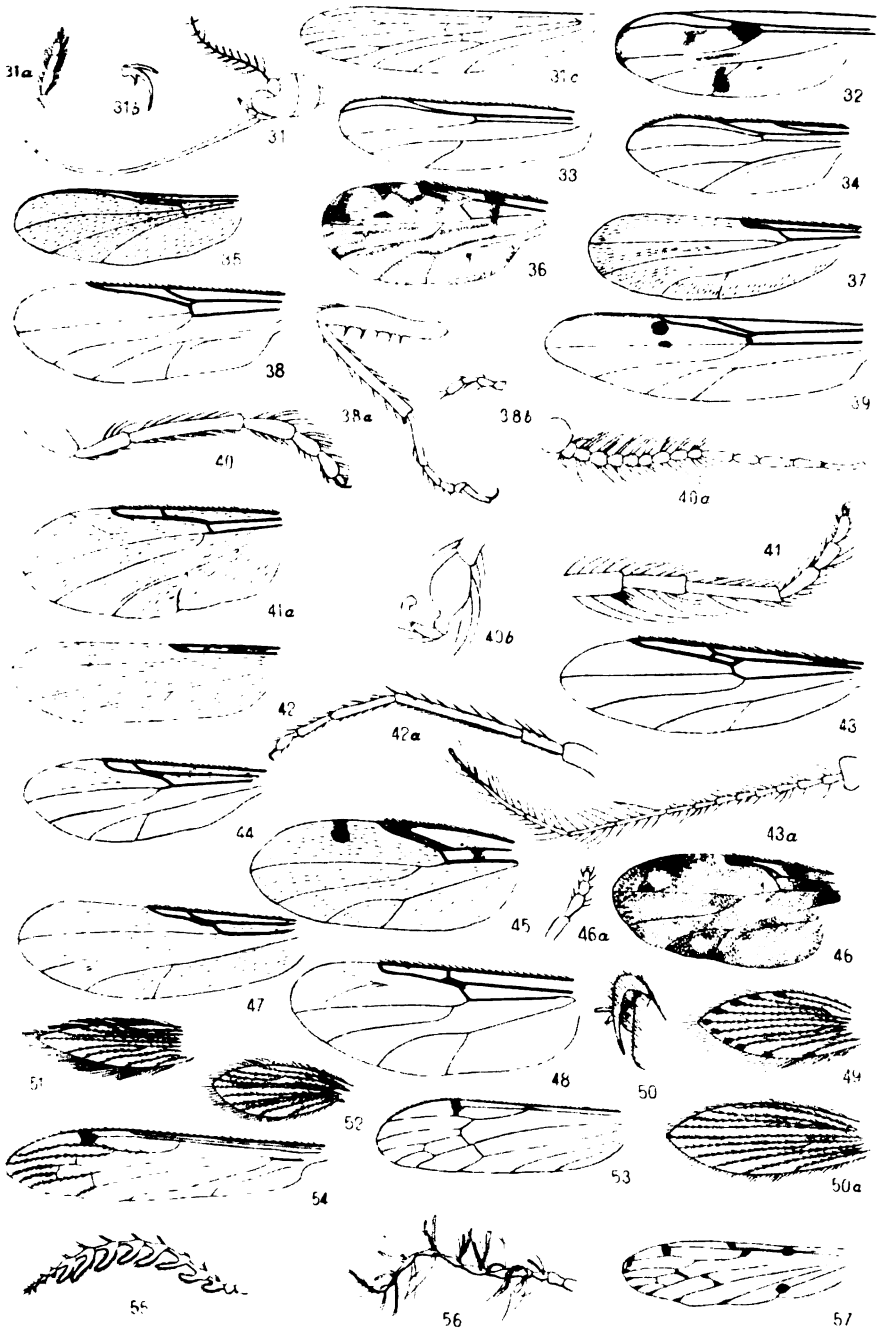

Edwin Wilson Cambridge

WEST INDIAN DIPTERA.

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fourth and fifth very small; hind metatarsi elongate and stout, the following two joints a little dilated, the fourth and fifth small. Wings hyaline, veins yellow.

Three specimens.

BIBIONIDÆ.

Scatopsæ.

Geoffroy, Hist. Nat. d. Ins., ii., 545, 1764.

1. *Scatopse pygmæa.* (Pl. VIII., fig. 26, wing.)

Scatopse pygmæa, Loew, Centur., v., 13.

Hab. District of Columbia.

♂. Black, but little shining, the margins of the mesonotum, the scutellum, the pleuræ in part, femora in part, knob of halteres, and tip of abdomen somewhat lighter coloured or brown. The tibiæ in part, and the tarsi, yellow or yellowish. Antennæ black, stout, the joints closely united, and gradually increasing in width to very near the tip. Wings greyish hyaline, the anterior thickened veins dark brown, the others light yellowish; the short veins do not reach nearly to the middle of the wing; the short prefurca of the forked cell takes its origin nearly opposite the connecting cross-vein of the subcostal cell; the branches of the forked cell are very long and strongly curved away from each other near the margin of the wing. Length 2 mm.

One specimen. Loew's description agrees well with this specimen, still, the identity cannot be positively stated without comparison of specimens from the United States.

BLEPHAROCERIDÆ.

Paltostoma.

Schiner, Verh. Zool.-Bot., Ges., 1866, p. 931.

1. *Paltostoma schineri,* n. sp. (Pl. VIII., figs. 27, wing; 27*a*, hypopygium; 27*b*, head of ♂.)

♂. Mesonotum without black spots. Length 2½–3 mm., of wings 5–6 mm.

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Front yellow or yellowish-red ; in width a little less than one-third of the head ; facets of the eyes uniform in size. Antennæ brown or blackish, finely pubescent, composed of thirteen joints, of which the first two are swollen, and the third somewhat dilated. Palpi small, for the most part concealed. Proboscis nearly four times as long as the vertical diameter of the head. Eyes pubescent. Thorax yellow or yellowish-red, the mesonotum a little darker in front, the pleuræ with patches of silvery lustre. Abdomen dark brown, the basal segments more or less yellowish. Legs yellow, the femora with blackish bands on the distal half, the tarsi blackish towards the tip ; hind tibiæ with spurs. Wings pure hyaline.

Four specimens. The present species, though seeming to agree closely in its structural characters with *P. superbiens*, Schiner, differs, aside from the markedly smaller size, in the absence of black spots on the mesonotum. It is not at all improbable that our specimens are conspecific with those mentioned by Osten Sacken (Cat. Dipt., 1878, 17,218) as occurring in Mexico.

Sackeniella, n. n.—Since the appearance of my paper (Kansas Univ. Quart., i., p. 119) in which I described a new genus of this family, I have discovered that the name *Snowia*, there used, has been previously employed for a genus of Lepidoptera. I here therefore substitute *Sackeniella* in honour of Dr. C. R. Osten Sacken.

CULICIDÆ.

Megarrhina.

Rob. Desvoidy, Essai, etc., in Mem. de la Soc. d'Hist. nat. de Paris, iii., 412, 1827.

1. *Megarrhina portoricensis.* (Pl. VIII., fig. 28, head of ♂ ; 28*a*, wing.)

Megarrhina portoricensis, Roeder, Stett. Ent. Zeit., 1885, p. 337.—Porto Rico.

Two specimens, male and female. Sea level.

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Ædes.

Meigen, Syst. Beschr., i., 13, 1818.

1. *Ædes pertinans*, n. sp. (Pl. VIII., figs. 29, antenna; 29*a*, hypopygium.)

♂, ♀. Face, basal joints of antennæ and base of proboscis yellowish; antennæ and proboscis otherwise nearly black, the former only a little more hairy in the male than in the female, the terminal joint of the male only a little longer than the preceding ones. Mesonotum brown, thickly covered with dark brown squamulæ; pleuræ yellow, with white tomentum. Abdomen deep brown, with brown squamulæ; venter yellow, with white squamulæ; male forceps small, yellow. Legs deep brown; the femora, and, in a less degree, the tibiæ showing the yellow ground-colour on the underside. Wings nearly hyaline; veins uniformly brown squamulate. Length 3 mm.

Six specimens. Sea level and 1000 feet.

2. *Ædes perturbans*, ♂, ♀. (Pl. VIII., fig. 30, head of ♀.)

♂, ♀. Head black. Antennæ brown; plumosity of the male long, abundant and black; terminal joint as long as the seven or eight preceding it together, and clothed with short hair; in the female the joints are more slender, and the terminal one is not longer than the two preceding it taken together, the verticils of moderate length. Proboscis black, as long as the abdomen; palpi brown. Thorax yellow, the mesonotum a little darker, and clothed with brown squamulæ. Abdomen yellowish, brownish-yellow or brown, the terminal segments and the hypopygium brown or blackish; clothed above with brown squamulæ. Legs brown or blackish, the femora, for the most part, yellow, and with a purplish or greyish reflection in some lights; in some specimens the tibiæ largely yellowish beneath the tomentum. Veins of the wings uniformly dark-brown squamulate. Length 4–5 mm.

Eight specimens.

Hæmagogus, n. g.

Allied to *Ædes*. Palpi short in both sexes; five-jointed, the first and fifth small, the second nearly as long as the third and fourth together. Anterior claws of male inequilaterally unipectinate; of the female simple.

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1. *Hæmagogus splendens*, n. sp. (Pl. IX., figs. 31, head of ♀ ; 31*a*, palpus ; 31*b*, claw of ♂ ; 31*c*, wing.)

♀. In ground-colour deep black, the base of the femora, and the coxæ in part, somewhat yellowish. Occiput, mesonotum and scutellum wholly covered with brilliant green and coppery squamulæ ; pleuræ densely snow-white squamulate. Abdomen brilliant steel-blue, in some reflections black ; a spot on the sides of each segment snow-white. Legs blue, like the abdomen, shining black in some reflections ; the undersides of the femora, towards the base, with white squamulæ. Wings hyaline, somewhat brownish in front, squamulæ black, evenly distributed. Length 5 mm.

Eight specimens. 1000 feet. The single male specimen was injured after the drawings were made. It does not appear to differ, however, from the female. The colouring must be much like that of *Culex cyaneus*, save of head and thorax.

Culex.

1. *Culex mosquito.*

Culex fasciatus, Wiedemann (*nec* Fabricius), Auss. Zw. Ins., i., 8.
Culex mosquito, Rob. Desvoidy, Culicides, etc., 390 ; Guerin et Percheron, Genera, etc., Dipt., pl. ii, fig. 1 ; Macquart, Hist. Nat. Dipt., i., 35 ; F. Lynch, A., Dipt. Argent. Culicidæ, 60, pl. iii, fig. 1.
Culex frater, Rob. Desvoidy, Culicides, etc.

A single female specimen, to which Lynch's description applies well, and whom I follow in the above-quoted synonymy. That *C. fasciatus*, Fabricius, is different from *C. fasciatus*, Wiedemann, seems evident, but that the present species is the same as the latter is not so fully apparent to me. Wiedemann says that "An den vordern Fusswurzeln ist die aüsserste Basis der einzelnen Glieder schneeweiss," while it is only the first joint that is thus marked in this species.

2. *Culex*, sp.

Several specimens of a luteous species, which are too ill-preserved to describe.

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CHIRONOMIDÆ.

CHIRONOMUS.

Meigen, Illiger's Mag., ii., 260, 1803.

TABLE OF SPECIES.

1. Front metatarsi not more than one-and-a-half times the length of the front tibiæ 3
   Front metatarsi two or more times the length of the tibiæ . 2
2. Wings spotted . . . . . *spilopterus*, n. sp.
   Wings not spotted . . . . . *anonymus*, n. sp.
3. Dorsum of thorax yellow, with brown stripes forming a V . . . . . *longimanus*, n. sp.
   Dorsum not so marked 4
4. Dorsum of thorax with dark brown spots . . *innocuus*, n. sp.
   Dorsum yellow, or brownish yellow, not spotted 5
5. Wholly light yellow . . . . . sp. 6
   Abdomen brown or black . . . . . *lugubris*, n. sp.

1. *Chironomus spilopterus*, n. sp. (Pl. IX., fig. 32, wing.)

♂, ♀. Face and front yellowish brown. Basal joint of antennæ brownish-yellow; flagellum brownish, the plumosity of the male blackish grey. Mesonotum brown or yellowish-brown, lightly whitish dusted; in well-preserved specimens brown vittate on the sides, and in front in the middle. Pleuræ black, in part luteous. Scutellum yellow or yellowish-brown. Abdomen black, with yellowish hair; in the male, slender; in the female, broader, and with a whitish posterior margin to the segments. Legs yellow, with rather abundant yellow hair; femora in part brown or brownish; front tibiæ not more than one-half of the length of the front metatarsi. Wings whitish hyaline, with pale blackish spots, which are more distinct when seen obliquely, and situated as follows: One near the base, another near the middle, and a third near or at the tip of the first posterior cell; a streak near the middle, and a spot near the tip of the cell in front of the forked cell; a spot on the posterior branch of the furcation, and one or two in the anal angle. Length 1¾–2¼ mm.

Eight specimens.

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2. *Chironomus anonymus*, n. sp.

♂. Head red, or reddish-yellow, the front more yellow. Antennæ brown, the first joint red; plumosity at the tip blackish. Mesonotum light brownish-red; two stripes and the humeri yellow; scutellum light yellow. Pleuræ light brownish or reddish-yellow. Metanotum brown. Abdomen blackish, the first segment and the distal part of the next two or three segments yellow or yellowish. Legs yellow; the immediate tip of the tibiæ and the tip of all the tarsal joints dark brown; proximal end of the front tibiæ also brown; front tibiæ about one-half of the length of their metatarsi, and not longer than the second joint. Wings nearly hyaline. Length 4–5 mm.

3. *Chironomus longimanus*, n. sp. (Pl. IX., fig. 33, wing.)

♂. Head yellow. Antennæ, save the basal joint, black or deep brown, the plumosity greyish-black. Thorax light yellow; a blackish-brown stripe, running from in front of the root of each wing, and joining in the middle in front, forming a V-shaped figure; below these stripes the sides of the mesonotum are of a purer yellow; the metanotum and a spot below the halteres blackish. Abdomen yellow; a black band on the posterior margin of the first and second segments; the fourth segment, the posterior, or greater part of the fifth segment, and the hypopygium, black or dark brown. Legs yellow; the base and tip of the four posterior femora, and the proximal end of their tibiæ brown; front legs much elongate, the metatarsi about one-fourth longer than their tibiæ. Wings nearly hyaline. Length 3–4 mm.

Numerous specimens.

4. *Chironomus lugubris*, n. sp.

♂. Similar to *Ch. longimanus*, but differs in lacking the brown stripes of the mesonotum, which is uniformly light yellow, in the abdomen being uniformly brown, and in the femora being wholly light yellow. Length 3–4 mm.

Six specimens.

5. *Chironomus innocuus*, n. sp.

♂. Head and basal joints of the antennæ light yellowish; palpi brown; antennæ brown. Thorax light yellow; mesonotum with a broad brown stripe in the middle in front, and, on either side, an oval brown spot, the three separated, and the middle stripe

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bisected, by a slender yellow stripe. Scutellum light yellow. Metanotum brown; halteres brown. Abdomen black, with black hair; the seventh and eighth segments light yellow, with yellow hair. Legs light yellow; the extreme tip of the four posterior tibiæ black; distal joints of the front tarsi infuscated, as also the front tibiæ; front metatarsi about one-third longer than their tibiæ. Wings hyaline. Length 3–4 mm.

6. *Chironomus*, n. sp.

♂. Light yellow, the antennæ brownish, and, rarely, the posterior part of the abdomen also brownish. Extreme tip of the four posterior tibiæ black; front metatarsi about one-fourth longer than their tibiæ. Wings hyaline; anal angle only feebly indicated. Length 2–2½ mm.

Orthocladius.

Van der Wulp, Tijdschr. voor Entom., xvi., lxx., 1874.

1. *Orthocladius debilis*, n. sp. (Pl. IX., fig. 34, wing.)

♂. Red or reddish-yellow. Plumosity of the antennæ brownish-black. Mesonotum with three shining brown spots or stripes, narrowly separated. Abdomen slender; each segment with a brown posterior band. Legs yellow; front femora brown on the distal end; front tibiæ light yellow on the proximal half or two-fifths, dark brown on the distal portion, about one-third longer than the corresponding metatarsi; front tarsi infuscated; the four posterior femora somewhat infuscated distally. Wings hyaline. Length 2½–3 mm.

Tanypus.

Meigen, Illiger's Mag., ii., 261, 1803.

1. *Tanypus flaveolus*, n. sp.

♂. Posterior forked cell not petiolate; wings hairy; front metatarsi nearly as long as their tibiæ. Light yellow; antennæ brownish, the plumosity grey; abdomen somewhat infuscated toward the tip; legs light yellow throughout, with rather abundant light yellow hair; wings hyaline, clothed moderately densely with grey hair. Length 1½–2 mm.

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2. *Tanypus indecisus*, n. sp. (Pl. IX., fig. 35, wing.)

♂, ♀. Wings hairy; posterior forked cell not petiolate; front metatarsi shorter than their tibiæ. Head and basal joint of the antennæ reddish-yellow; palpi and the remainder of the antennæ brownish-yellow; antennal plumosity of the male grey, towards the tip blackish. Thorax reddish-yellow; bare, opaque, with three slender, reddish-brown stripes in front, separated by ashy intervals; on each side posteriorly with an elongate brown spot, the middle of which is ashy; scutellum light yellow; metanotum brownish-red. Abdomen slender; opaque brown, the posterior angles and borders of the segments ashy; the yellow of the venter sometimes encroaches upon the brown of the dorsum; sixth and seventh segments more distinctly yellow; the seventh and eighth segments with the posterior portion blackish. Legs yellow, less hairy than in *T. flaveolus*. Wings hyaline, moderately hairy. Length 1½–2¼ mm.

Ceratopogon.

Meigen, Illiger's Mag., ii., 1803.

Table of Species.

1. Two subcostal cells, that is. the third vein is either contiguous or connected by a cross-vein with the first vein 3
   One subcostal cell; the third vein is distinctly separated from the first throughout its course, and is not connected with it by a cross-vein 2
2. A small, round, black spot just back of the tip of the third vein . . . . . *punctipennis*, n. sp.
   No such spot . . . . . *venustulus*, n. sp.
3. Metatarsi shorter than the following joint; wings hairy . . 4
   Metatarsi much longer than the following joint 6
4. Antennæ not longer than the mesonotum; wings densely hairy . . . . . *eriophorus*, n. sp.
   Antennæ distinctly longer than the mesonotum 5
5. Abdomen banded; hind metatarsi about one-half the length of the following joint . . . *propinquus*, n. sp.
   Abdomen not banded; hind metatarsi about one-third the length of the following joint; tarsi very slender *flavus*, n. sp.

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6. The posterior branch of the fourth vein arises before the origin of the anterior cross-vein; wholly deep black, *longicornis*, n. sp.
   The furcation of the fourth vein occurs beyond the cross-vein 7
7. Wings bare, or hairy at the tip only 8
   Wings hairy throughout, or nearly so 13
8. Black species; mesonotum shining . . . . . *thirsites*, n. sp.
   Mesonotum not shining 9
9. Abdomen opaque black, with a slender yellow median stripe and incisures . . . . . *lituratus*, n. sp.
   Abdomen without distinct markings 10
10. Wings with distinct markings; first and third veins indistinctly separable 11
    Wings without distinct markings . . . . . *sequax*, n. sp.
11. Wings with three blackish spots along the costa, the other markings pale or obsolete . . . . . *decor*, n. sp.
    One blackish spot on the costa at the tip of the first vein, the other markings distinct 12
12. Dorsum of thorax light opaque yellowish. *phlebotomus*, n. sp.
    Dorsum of thorax with numerous, rounded, dark brown spots on a yellowish-grey ground . . *maculithorax*, n. sp.
13. Deep black; mesonotum shining . . . . . *pygmæus*, n. sp.
    Thorax yellow or brownish-yellow . . . . . *lotus*, n. sp.

1. *Ceratopogon maculithorax*, n. sp. (Pl. IX., fig. 36, wing.)

♀. Wings hairy at the tip; third vein contiguous with the first, terminating at or near the middle of the wing; fourth vein with a prefurca, though indistinct; metatarsi as long as the following joints together. Proboscis, palpi, face, front and basal joint of antennæ yellowish-brown; proboscis slender; second joint of palpi thickened. Antennæ yellow, not as long as the thorax. Mesonotum opaque yellowish-grey, with numerous, small, rounded, dark-brown spots on a yellowish-grey ground, hair not abundant or long, yellow. Scutellum yellow on the sides, brown in the middle. Halteres light yellow. Pleuræ black and luteous, lightly greyish pruinose. Legs yellow; all the femora, and the front and hind tibiæ with a broad blackish ring; the immediate tip of the femora also blackish. Wings with pale brown markings with hyaline or whitish spots and streaks; a spot at the tip of the first and third veins blackish. Length 2 mm.

One specimen.

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2. *Ceratopogon pygmæus*, n. sp. (Pl. IX., fig. 37, wing.)

♀. Shining black; wings hairy; first and third veins closely approximated, terminating before the middle of the wing. Metatarsi nearly as long as the following joints together. Black; antennæ brown; scutellum and halteres yellow, genital organs and legs luteous. Mesonotum shining. Abdomen opaque. Wings hyaline, sparsely hairy. Length 1 mm.

Three specimens. Sea level.

3. *Ceratopogon venustulus*, n. sp. (Pl. IX., figs. 38, wing; 38*a*, front leg; 38*b*, palpus.)

♀. The third longitudinal vein terminates in the costa towards the tip of the wing, distinctly separated from, and not connected by a cross-vein with, the first longitudinal vein; front femora with spines on the inner underside; claws not denticulate, and without pulvilli; wings bare. Deep black. Antennæ reddish-brown, slender; if turned backward, reaching about to the middle of the mesonotum. Mesonotum deep shining black. Abdomen opaque, black, elongate. Halteres black. Legs black; the base of the femora, and the tibiæ more or less yellowish; first two or three joints of the tarsi yellow or luteous; hind tibiæ with fine, not very long, black hairs on the outer side; metatarsi slender, as long as the three following joints together. Wings nearly hyaline, bare. $1\frac{1}{4}$–$1\frac{1}{2}$ mm.

Five specimens. Sea level. May. In one of the specimens, the legs are yellow throughout, but I do not distinguish other differences. It is possible that this species is the same as *C. trivialis*, Loew, but the difference in size and the colour of the tarsi render the identity doubtful.

4. *Ceratopogon punctipennis*, n. sp. (Pl. IX., fig. 39, wing.)

♂, ♀. Wings bare; one subcostal cell, the third vein is well separated from the first, and terminates beyond the middle of the wing; prefurca of fourth vein obsolete or nearly so; first joint of the tarsi elongate, fourth short, fifth elongate; pulvilli wanting. Plumosity of the male antennæ yellow; terminal joints in both sexes black, the basal joint reddish. Face and proboscis dark brown; palpi slender, the second joint elongate. Thorax black; mesonotum opaque, with whitish pubescence, variable in different lights. Abdomen deep brown or black, with a whitish, variable

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pruinosity. Femora and tibiæ yellowish-brown or reddish-brown; tarsi yellow, the tip of each joint brown or black; all the femora on the upper side distally, and all the tibiæ on the outer side, most conspicuous in the hind pair, with black bristles. Wings nearly hyaline; a rounded blackish spot back of the third vein at its tip, and a smaller one nearly opposite on the fourth vein. Length 3 mm.

5. *Ceratopogon eriophorus*, n. sp. (Pl. IX., figs. 40, tarsus; 40*a*, antenna; 40*b*, palpus.)

♂. Wings densely hairy; the third vein scarcely distinguishable from the first, and terminating before the middle of the wing; metatarsi about one-half of the length of the following joint, the last joint not elongate; pulvilli hairy. Face, antennæ and palpi brown or black; second joint of the latter much thickened, the third slender. Antennæ yellow, somewhat infuscated distally. Mesonotum dark-brown or black, opaque, and with abundant, light yellow hair; scutellum like the mesonotum. Halteres light yellow; pleuræ yellowish-brown. Abdomen stout, dark brown, the incisures narrowly yellowish; clothed with light-yellow hair. Legs yellow, with abundant, rather long, yellow hair. Wings hyaline beneath the dense, dark-coloured hair. Length 1½–2 mm.

Four specimens. 1000–1500 feet.

6. *Ceratopogon propinquus*, n. sp. (Pl. IX., figs. 41, tarsus; 41*a*, wing.)

♂. Wings hairy; the third vein terminates about the middle of the wing, and is indistinctly separated from the first vein; fourth vein with a prefurca, though indistinct; first tarsal joint about one-half of the length of the second joint, the last joint not elongated; pulvilli hairy. Head and antennæ yellow, the latter somewhat infuscated distally, the plumosity blackish-grey. Second and third joints of the palpi enlarged. Metanotum opaque brown, more yellowish near the middle in front; rather thickly, light-yellow, hairy. Abdomen slender, with abundant, and long, yellow pile; anterior segments yellow, with a broad black band, which becomes successively broader till the last segments are wholly black. Legs yellow, with long yellow hair; the tip of the middle and hind femora, at least, and the proximal end of their tibiæ blackish. Wings nearly hyaline beneath the rather abundant hair. Length 2¼ mm.

One specimen.

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7. *Ceratopogon flavus*, n. sp. (Pl. IX., figs. 42, wing; 42*a*, tarsus.)

♂. Wings hairy; the third vein terminates distinctly before the middle of the wing, and is very close to the first vein; fourth vein with a prefurca, though indistinct; first joint of the tarsi about one-third of the length of the second joint, the fifth a little shorter than the fourth; pulvilli hairy. Face, proboscis, palpi, and antennæ yellowish, the last brownish toward the extremity; the plumosity blackish-grey. Thorax yellow, the mesonotum brownish-yellow, opaque, with light-coloured hair. Abdomen slender, in large part brown or blackish, its base and tip yellow; hair of the venter long. Legs yellow, with long yellow hair; the tarsi a little infuscated. Wings hyaline beneath the hair. Length 2 mm.

Ten specimens. Sea level, and 1000 feet.

8. *Ceratopogon longicornis*, n. sp. (Pl. IX., figs. 43, wing; 43*a*, antenna.)

♀. Wings bare; the third vein terminates in the costa much beyond the middle of the wing; two submarginal cells. The posterior branch of the fourth vein arises before the anterior cross-vein; femora without spines. Antennæ slender, much elongate, if turned back, reaching to near the middle of abdomen, the distal four joints nearly equal in length to all the preceding together. Mesonotum deep shining black throughout; pleuræ lightly pruinose. Abdomen elongate, shining. Legs black or deep reddish-brown; femora not thickened; metatarsi slender, as long as the three following joints together. Wings nearly hyaline, narrow, with no perceptible anal angle. Length 1½–2 mm.

Three specimens. 500 feet.

9. *Ceratopogon thersites*, n. sp. (Pl. IX., fig. 44, wing.)

♂. Two subcostal cells; the third vein terminates beyond the middle of the wing; wings bare; prefurca of the fourth vein very short; first joint of the tarsi elongate, last joint not elongate; pulvilli hairy. Abdomen black, not shining, elongate, yellow at tip and on the venter. Thorax black or reddish-brown, the mesonotum shining moderately through the sparse yellowish pubescence or pollen. Legs yellow; the tarsi blackish at tip. Wings hyaline. Antennæ brown or blackish, yellowish at base. Palpi and proboscis brown. Length ½–¾ mm.

Eight specimens. Sea level, and 1000 feet.

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10. *Ceratopogon lituratus*, n. sp.

♀. Two subcostal cells; the third vein terminates beyond the middle of the wing; prefurca of fourth vein short; wings a little hairy on the distal margin; first joint of the tarsi much longer than the second, the last joint not elongate. Proboscis yellow; labium brown; face elsewhere, basal joints of the antennæ, and the frontal triangle, yellow. Antennæ brown or blackish on the distal portion, yellowish on the proximal part; about as long as the mesonotum. Occiput yellow. Mesonotum opaque brown, the humeri and sides in front, the post-alar callosities, and the scutellum, light yellow; halteres light yellow. Abdomen opaque blackish-brown; the first segment, except a small spot on each side, the last segment, and a slender median stripe and the narrow posterior margin of each segment, light yellow. Legs yellow. Wings hyaline. Length 1 mm.

Four specimens.

11. *Ceratopogon decor*, n. sp. (Pl. IX., fig. 45, wing.)

♀. Wings sparsely hairy; the third vein terminates a little beyond the middle of the wing, and only a short distance from the tip of the first vein; fourth vein with a prefurca; metatarsi longer than the following joint; pulvilli hairy. Antennæ yellow, somewhat longer than the mesonotum; face, proboscis, and palpi brownish-yellow. Mesonotum brownish-yellow, opaque; the humeri, pleuræ, and a part of the scutellum light yellow; pleuræ, in part, black. Abdomen black, with yellowish incisures. Legs yellow; all the femora at the tip, and a median ring on the hind pair, black Wings nearly hyaline, with three blackish spots along the costa, one at the outer part of the subcostal cell, another near the middle of the first posterior cell, and the third, less distinct, across the middle of the costal and first basal cell; posterior part of the wings with paler markings, which, however, become distinct when seen obliquely. Length 1¼–2 mm.

Three specimens.

12. *Ceratopogon phlebotomus*, n. sp. (Pl. IX., figs. 46, wing; 46*a*, palpus.)

♀. Third vein very close to the first, terminating in the costa about the middle of the wing; wings infuscated, with whitish spots, hairy at the tip; metatarsi distinctly longer than the following joint, about as long as the next two or three together; pulvilli wanting. Antennæ, face, proboscis and palpi black or

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dark brown, the antennæ not as long as the thorax. Thorax black; mesonotum opaque yellowish pollinose, with three slender indistinct lines; in the middle behind, whitish; pleuræ lightly whitish pruinose. Abdomen opaque black, the anterior segments somewhat luteous; the posterior margin of the segments very narrowly whitish, perhaps due to the drying. Legs luteous. Wings rather broad, tinged with brownish, leaving six or seven rounded, hyaline or whitish spots in the cells; tip of the costal cell blackish. Length 1–1½ mm.

Four specimens, one of which bears the following label, apparently in Mr. H. H. Smith's handwriting: "This is the common 'sand-fly' about the southern end of the island, but is not very troublesome. Bites late in the afternoon, before sunset; sometimes during the heat of the day."

13. *Ceratopogon lotus*, n. sp. (Pl. IX., fig. 47, wing.)

♂. Two subcostal cells; the third vein unites with the costa a little beyond the middle of the wing; wings hairy; metatarsi as long as the three following joints together. Antennæ brown, yellowish towards the proximal end. Proboscis yellowish. Mesonotum brownish yellow, with yellowish hair. Abdomen black or brownish black. Legs yellow, a little infuscated towards the tip of the tarsi; with light coloured hair; pulvilli wanting. Wings hyaline beneath the light coloured pubescence; posterior branch of the fourth vein indistinct in its proximal part. Length 1–1½ mm.

Two specimens. 1000 feet.

14. *Ceratopogon sequax*, n. sp. (Pl. IX., fig. 48, wing.)

♂. Two subcostal cells; the third vein terminates distinctly beyond the middle of the wing; wings bare; prefurca of anterior fork short; metatarsi as long as the two following joints together. Antennæ dark-brown; yellowish on the proximal portion, the plumosity yellowish. Palpi and proboscis yellowish-brown. Thorax brown, the scutellum and sides of dorsum more yellowish; only a little shining. Abdomen slender, dark brown. Legs luteous or yellow, with long hairs on the tibiæ. Wings hyaline. Length 1½ mm.

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PSYCHODIDÆ.

Psychoda.

Latreille, Precis, etc. 1796.

Table of Species.

1. Wings with small dark spots at the tips of the veins, *alternata*, Say.
   Wings not with dark spots at the tips of the veins . . . 2
2. Black or dark brown, with dark hair . . . *antennalis*, n. sp.
   Light yellow, with white hair 3
3. Wings very narrow, lanceolate . . . . *angustipennis*, n. sp.
   Wings of the usual shape . . . . . *pallens*, n. sp.

1. *Psychoda alternata.* (Pl. IX., fig. 49, wing.)

Psychoda alternata, Say, Long's Exped., App., 358; Compl. Wr., i., 242; Wiedemann, Aus. Zw. Ins., i., 23; Williston, Entom. News, iv., 114; Banks, Can. Entom., xxvi., 330.

Hab. New England States; Pennsylvania; South Dakota; Kansas.

A single, injured specimen seems to belong to this species, though I cannot be sure of the identity without examining better preserved specimens.

2. *Psychoda antennalis*, n. sp.

♂. Black or dark brown, with dark hair. Antennæ stout, the joints moniliform, about as long as the thorax. Wings with a distinct picture formed by the hairs, which are black, save an apical white fringe, and two subconfluent spots of the same colour beyond the middle on the outer side of two spots of denser black hair. Front legs black, the base of the metatarsi and the middle joints white. Length 1–1¼ mm.

3. *Psychoda pallens*, n. sp. (Pl. IX., figs. 50, hypopygium; 50*a*, wing.)

♂. Wholly light-yellow, with white or yellowish-white hair. Hair of the wings not long; at the tip a minute blackish spot; furcations approximated to the base of the wing. Antennæ rather slender, not as long as the mesonotum, with rather long verticellate hairs. Legs moderately long; tarsi rather stout. Length 1–1¼ mm.

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4. *Psychoda angustipennis*, n. sp. (Pl. IX., fig. 51, wing.)

♀. Yellow, with nearly white hair. Wings very narrow, acutely lanceolate, covered uniformly with long black hair; a small tuft of white at the extreme tip; another larger one on each side beyond the middle, and yet another toward the base on the posterior margin; hair on the posterior margin long and abundant. Antennæ light-yellow, about as long as the mesonotum; sixteen-jointed, the basal joints darker, the following ones slender. Thorax and abdomen light reddish-yellow, the hair of the abdomen slightly intermixed with blackish. Legs rather stout, light-yellow; the terminal joints of the tarsi somewhat infuscated. Length 1–1½ mm.

Pericoma.

Walker, Ins. Brit., ii., 256, 1856.

1. *Pericoma albitarsis*, n. sp. (Pl. IX., fig. 52, wing.)

♂, ♀. Black or brown, with black or dark-brown hair. All the tarsi white. Antennæ slender, rather longer than the thorax; brownish-yellow or brown, sixteen-jointed. Palpi elongate. Hair of the wings uniform in colour and uniformly distributed; that along the hind border rather short. Terminal joints of the tarsi rather short, slightly infuscated. Length 1–1½ mm.

Ten specimens.

TIPULIDÆ.

Geranomyia.

Haliday, Ent. Mag., i., 154, 1833.

1. *Geranomyia pallida*, n. sp. (Pl. IX., fig. 53, wing.)

♂, ♀. Front and vertex brownish-yellow, whitish pruinose. Antennæ brown, the basal portion more or less yellow. Rostrum yellowish at the base, brownish on the distal part; nearly as long as the thorax and abdomen together. Thorax and abdomen light-yellow, the mesonotum in some specimens yellowish-red. Knob of halteres yellow. Legs yellow. Wings hyaline; stigma distinct,

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Explanation of Plate X.

Fig. 57*a*. *Rhipidia subpectinata*, ♂ antenna.
58. *Limnobia insularis*, wing.
59. *Rhamphidia albitarsis*, wing, 59*a* hypopygium.
60. *Atarba puella*, wing, 60*a* hypopygium.
61. „ *pleuralis*, antennæ, 61*a*, 61*b* genitalia, 61*c* wing.
62. *Teucholabis complexa*, wing.
63. „ *annulata*, wing.
64. *Elliptera* species, wing, 64*a* genitalia.
65. *Diotrepha mirabilis*, wing, 65*a* hypopygium.
66. „ *concinna*, wing.
67. *Mongoma pallida*, wing.
68. *Epiphragma sackeni*, wing.
69. *Tipula subinfuscata*, wing.
70. *Pachyrrhina elegantula*, wing.
71. *Polymera albitarsis*, ♂ part of antenna, 71*a* ♀ antenna, 71*b* wing.
72. Genus near *Rhipidia*, part of antenna, 72*a* hypopygium.
73. *Dixa clavulus*, wing.
74. *Rhyphus dolorosus*, wing.
75. *Pelagomyia albitalus*, ♂ head.
76. *Aochletus bistriatus*, antenna.
77. *Tabanus alcis*, antenna.
78. „ species, antenna.
78*bis*. *Chrysopila atra*, wing.
79. *Erax rufitibia*, wing.

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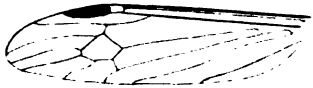
57a

58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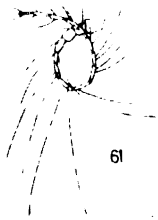
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61a

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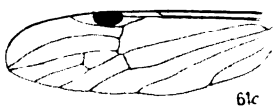
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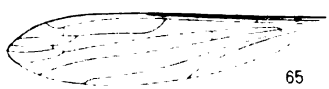
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65a

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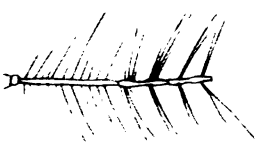
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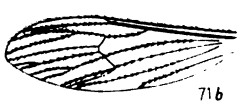
71b

71a

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72a

73

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78bis

Edwin Wilson Cambridge

WEST INDIAN DIPTERA.

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brownish; termination of the auxiliary vein at a distance beyond the origin of the second longitudinal vein about equal to the length of the first section of the third vein. Length 5 mm.

Three specimens, leeward side, and at an altitude of 1000 feet.

2. *Geranomyia*, sp.

♀. Yellowish-red, the mesonotum with three, rarely distinct, slender, brownish stripes. Antennæ somewhat infuscated. Head black, whitish pruinose. Antennæ yellowish, or yellowish-brown. Proboscis black. Legs red; the tarsi luteous. Wings nearly hyaline; stigma small, distinct; the auxiliary vein terminates opposite the origin of the second longitudinal vein. Knob of halteres brown. Proboscis as long as the abdomen. Length 5 mm.

Six specimens.

3. *Geranomyia rostrata.*

Limnobia rostrata, Say, Journ. Acad. Nat. Sci. Phil., iii., 22; Wiedemann, Auss. Zw. Ins., i., 35.

Geranomyia rostrata, Osten Sacken, Proc. Acad. Nat. Sci. Phil. 1859, 207; Monogr., etc., iv., 79.

Hab. Atlantic States; Canada; Cuba.

Two specimens, male and female, which agree fairly well with Osten Sacken's description and observations. The brown stripes of the dorsum of the thorax are well marked, but the tip of the tibiæ is not black, and there are but four brown spots along the front border of the wing, as Wiedemann describes.

RHIPIDIA.

Meigen, Syst. Beschr., i., 153 (122), 1818.

1. *Rhipidia bipectinata*, n. sp. (Pl. IX., fig. 54, wing.)

♂. Antennæ long, bipectinate; thorax without brown stripes; wings clouded, unspotted. Length 5 mm.

Rostrum palpi and antennæ black, the last long-bipectinate, beginning with the second joint of the flagellum. Mesonotum light opaque yellow in front; in the middle, in front of the suture, brownish; behind the suture, with two large brown spots. Pleuræ brown; a longitudinal, more blackish stripe, just below

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the root of the wings. Metanotum brown, yellowish on the sides. Abdomen dark brown, the forceps reddish. Halteres with a brown knob. Legs brown, the base of the femora yellowish. Wings nearly uniformly clouded with blackish, the stigma darker; termination of the auxiliary vein nearly opposite the proximal end of the submarginal cell.

One specimen. 1000 feet. In this specimen the anterior cross-vein is situated nearly opposite the middle of the discal cell.

2. *Rhipidia unipectinata*, n. sp. (Pl. IX., fig. 55, antenna.)

♂. Brown spots along the anterior border of the wing; antennæ long-unipectinate; halteres brown; thorax with a brown stripe and a lateral brown spot. Length 5 mm.

Rostrum, palpi and antennæ black. Flagellum of antennæ, except the terminal joints, unipectinate, the pectinations beginning with the first joint and increasing in length to the seventh. Thorax yellow; the dorsum with a median brown stripe, and, on either side behind, a rounded yellow spot, leaving a yellow space between them; these brown spots are continued on the scutellum, enclosing a small yellow spot. Pleuræ with a slender, longitudinal brown stripe. Halteres brown. Metanotum brown. Abdomen, brown, the venter yellowish. Legs brown, the femora lighter coloured toward the base; second, third, and fourth joints of the hind tarsi light yellowish. Wings with a blackish tinge, with inconspicuous darker clouds along the anterior margin and on the cross-veins; before and beyond the dark-brown stigma, a rounded, more hyaline spot; apical portion of the costa more distinctly clouded; insertion of the auxiliary vein a little beyond the middle of the prefurca.

One specimen. 1000 feet.

3. *Rhipidia costalis*, n. sp. (Pl. IX., fig. 56, antenna.)

♂. Antennæ bipectinate; thorax not striped; costa with brown spots or clouds. Length 5 mm.

Palpi, rostrum and antennæ black, the latter bipectinate, but the pectinations shorter and more slender than in *R. bipectinata*. Thorax brownish-yellow, the mesonotum opaque yellowish-red, with a spot in front, and two behind the suture, faintly brownish. Knob of halteres brownish. Abdomen reddish, with brown posterior borders to the segments; forceps red. Legs brown; the

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tip of the slightly clavate femora yellow ; base of femora yellowish. Wings tinged with brownish ; four large brown spots or clouds along the costa, the outermost one confluent with a brown cloud at the origin of the third vein ; the outer cross-veins with brown clouds, and the distal costal portion more distinctly clouded ; between the brown spots along the costa, the intervals are more purely hyaline ; termination of the auxiliary vein at or before the middle of the prefurca.

Two specimens. 1500 feet.

4. *Rhipidia subpectinata*, n. sp. (Pl. IX., fig. 57, wing ; Pl. X., fig. 57*a*, antenna of ♂.)

♂. Antennæ subpectinate in both sexes. Mesonotum conspicuously lighter coloured on the sides ; wings with small dark spots. Length 4 mm.

Head ochraceous yellow. Antennæ yellow, slightly brownish at the tip. Palpi brown or blackish. Mesonotum on the upper surface yellowish-brown, or brownish-yellow, forming a long, subtriangular figure, the margins of which are dark brown ; just outside or below this line, conspicuously light yellow, extending in a nearly equal width from the root of one wing to that of the other ; below the light yellow band, near the upper part of the thorax, a narrow, longitudinal, nearly black stripe. Scutellum and metanotum light yellow ; the former with two spots, the latter with a median stripe and a lateral spot pale brown. Legs yellow, the two or three terminal joints of the tarsi black. Wings nearly hyaline, with small brown spots, as shown in the figure.

Two males and two females. 1000 feet. The female scarcely differs from the male.

LIMNOBIA.

Meigen, Syst. Beschr., i., 92, 1818.

1. *Limnobia insularis*, n. sp. (Pl. X., fig. 58, wing.)

♂. First longitudinal vein recurved to the second near its tip ; femora without brown rings. Length 6 mm.

Front black. Antennæ, palpi and rostrum brown. Thorax brownish-red, the mesonotum shining ; pronotum long, somewhat lighter coloured ; mesonotum with inconspicuous, narrow, brown stripes. Abdomen and halteres dark brown. Wings infuscated, strongly so along the costa distally. Legs dark brown, the tarsi more yellowish, except the terminal joints, which are blackish.

One specimen. 1000 feet.

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RHAMPHIDIA.

Meigen, Syst. Beschr., vi., 281, 1830.

1. *Rhamphidia albitarsis.* (Pl. X., figs. 59, wing; 59*a*, hypopygium.)

Rhamphidia albitarsis, Osten Sacken, Berl. Ent. Zeitschr., xxxi., 184, 1887.

Hab. Porto Rico.

Two specimens, male and female, agreeing well with the description.

ELEPHANTOMYIA.

Osten Sacken, Proc. Acad. Nat. Sci. Phil., 1859.

1. *Elephantomyia longirostris*, n. sp.

♂. Proboscis about one and a-half times the length of the body; wings with a brown stigma and brownish clouds along the cross-veins. Length of body 6 mm, of proboscis 8½ mm.

Head yellow. Proboscis very distinctly longer than the body, finely pubescent. Antennæ brownish-yellow; basal joints yellow. the verticils black. Thorax yellow; a rather broad, brownish stripe along the middle, and a shorter, similarly coloured one on each side. Halteres yellow. Abdomen light yellow, with a broad, brown band on the posterior part of each segment; forceps brownish. Wings lightly tinged with brownish; with distinct brownish or brown clouds along the distal part of the costa, and along the cross-veins. Legs yellow; femora brown at tip; neuration as in *E. westwoodi*, O. S.

This species is evidently closely allied to the type of the genus, and I at first believed that it was the same, but the more elongate proboscis and the brownish clouds of the wings seem sufficient to separate them.

ATARBA.

Osten Sacken, Monogr., etc., iv., 127, 1868.

1. *Atarba puella*, n. sp. (Pl. X., figs. 60, wing; 60*a*, hypopygium.)

♂, ♀. Antennæ short and slender, not as long as the mesonotum, the first two joints thickened; in the male, the following joints slender, and each, except the distal ones, with two long hairs. Front, and basal joints of the antennæ yellow, the remainder of the antennæ and the palpi brown. Thorax yellow, the mesonotum brown, the metanotum brownish. Abdomen

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brownish-yellow, the male organs more yellowish. Legs brownish throughout, the tarsi finely pubescent. Wings nearly hyaline; no stigma. Length 3–4 mm.

Twelve specimens. This and the following species differ from the type of this genus, as described by Osten Sacken, in the structure of the antennæ and in some peculiarities of the neuration, but the differences will not justify generic separation. Both species have distinct empodia, and there appears to be a minute spur on the middle tibiæ.

2. *Atarba pleuralis*, n. sp. (Pl. X., figs. 61, antenna; 61*a*, *b*, genitalia; 61*c*, wing.)

♂, ♀. Front yellow. Antennæ and palpi blackish. Mesonotum brownish-red; the colour in shape of an elongated triangle, the base of which is the scutellum; the lateral margins of the mesonotum show a slender, dark-brown stripe; immediately below which the colour is light yellow, extending over the dorso-pleural suture. Pleuræ dark-brown, with a longitudinal stripe above the base of the coxæ; or, the pleuræ may be otherwise described as having two dark brown stripes enclosing a light yellow one. Abdomen brownish-red, with a narrow, dark-brown band on the posterior margin of each segment, and with a median, indistinct brownish stripe. Coxæ light yellow; femora yellow, with a brown ring just before the light yellow tip, which colour extends narrowly on the base of the tibiæ; tibiæ and tarsi brown. Wings tinged with brown; stigma dark-brown; the marginal cell is shorter and wider than in *A. puella*. Length 4–5 mm.

Six specimens.

TEUCHOLABIS.

Osten Sacken, Proc. Acad. Nat. Sci. Phil., 1859.

1. *Teucholabis complexa*. (Pl. X., fig. 62, wing.)

Teucholabis complexa, Osten Sacken, Proc. Acad. Nat. Sci. Phil., 223, 1859; Monogr., etc., iv., 129.

Hab. District of Columbia; New York; Illinois.

Sixteen specimens. The description of this species applies so well to these specimens that there can be but little doubt of the identification. The brown stripes of the mesonotum are only feebly indicated in most of the specimens; the posterior part of the abdominal segments is yellow, and the tibiæ are brownish.

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2. *Teucholabis annulata*, n. sp. (Pl. X., fig. 63, wing.)

♂, ♀. Front black; palpi brown; rostrum and first joint of the antennæ yellow; flagellum brown or black. Mesonotum shining, with three broad, more or less confluent, shining, deep broad stripes, the middle one not reaching the suture, the lateral ones not extending far in front of it; elsewhere the mesonotum, like the scutellum and anterior part of the metanotum, is light yellow. Pleuræ dark yellow or brown; when seen obliquely, with a silvery sheen. Posterior part of metanotum brown. Abdomen yellow, with a broad brown band on the anterior part of each segment. Legs yellow; all the femora brown at the tip, and with a brownish ring beyond the middle; all the tibiæ and the first three tarsal joints brown at the tip, the last two joints of the tarsi black. Wings hyaline; the stigma and a cloud at the end of the costa—sometimes obsolete—brown. Length 7–8 mm.

Twelve specimens. In one female the abdomen is black, with a narrow yellow posterior margin to the segments; in others brown, with a broader yellow border. The neuration is very much like that of *T. complexa*; both the second and third veins are curved less, and the second vein extends further towards the tip of the wing.

Elliptera.

Schiner, Wien. Ent. Monatschr., vii., 222, 1863.

1. ?*Elliptera*, sp. (Pl. X., figs. 64, wing; 64*a*, genitalia.)

♀. Head brownish, or brownish-yellow, including rostrum and palpi. Antennæ yellow, the first two joints red. Mesonotum brownish grey, with four narrow, brownish stripes; humeri and sides of prothorax light yellow. Pleuræ yellow, obscurely brownish in places. Abdomen light luteous yellow. Legs yellow; the tip of femora, tibiæ, and the distal joints of the tarsi brownish. Wings hyaline; stigma faintly brown. Length 5 mm.

One specimen. The present species can hardly be a true *Elliptera*, because the anterior veins do not show the approximation characteristic of that genus, but it seems to agree in all other respects. The antennæ are sixteen-jointed, the joints oval in shape; the thorax is gently convex, the pronotum small, the abdomen is elongate, etc. The neuration is shown in the figure. There are no spurs to the tibiæ.

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Diotrepha.

Osten Sacken, Cat. Dipt., xxviii., 1878.

Wings very slender; great cross-vein near their proximal third; three posterior cells; no discal cell. Antennæ sixteen-jointed, simple. Rostrum projecting, nearly as long as the head. Neck slender. Mesonotum but little convex, elongate and slender; metanotum elongate. Legs slender, distinctly pubescent; tibiæ without spurs. Abdomen very slender; male forceps obtuse; upper valve of ovipositor small and gently curved.

1. *Diotrepha mirabilis.* (Pl. X., figs. 65, wing; 65*a*, hypopygium.)

(?) *Diotrepha mirabilis,* Osten Sacken, Cat. Dipt., 1878, p. 220.

♂, ♀. Proboscis, palpi, and antennæ brownish. Antennæ microscopically pubescent, and with verticils of short hairs: in length the antennæ would reach to about the suture, if bent backwards. Thorax yellowish-brown, or brownish-red. Abdomen yellowish-brown, the posterior margins of the segments, or, the posterior segments, wholly brown; in some specimens the abdomen is deep brown throughout. Legs light yellow; the tibiæ and the tarsi more nearly white; the tip of all the femora and tibiæ dark-brown. Wings nearly hyaline; a fringe of hairs along the posterior margin. Length of body, 7 mm.; of wings, 5 mm.

Hab. St. Vincent, Georgia, Texas, Cuba.

Eight specimens. "This species is abundant in forest glen, 1000 feet, near a stream, Sept. Alights on the lower side of leaves."—H. H. Smith.

2. *Diotrepha concinna,* n. sp. (Pl. X., fig. 66, wing.)

♀. Differs from *T. mirabilis* in the darker colour, the proboscis, palpi, and antennæ being blackish; in the legs being light yellow, and in the absence of the brown tip to femora and tibiæ; and in the neuration as shown in the figure. The wings are uniformly and distinctly tinged with brown. Length 6 mm.

One specimen. Sea level.

Mongoma.

Westwood, Trans. Ent. Soc. London, 1881, p. 364.

Antennæ sixteen-jointed, if bent backward, reaching about to the base of the wings; second joint a little shorter than the first,

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both thickened; the following joints slender, distinctly separated, finely pubescent. Rostrum rounded, a little prolonged, but shorter than the head; palpi inserted towards its base, rather slender, the ultimate joint shorter than the penultimate, the two together about equal to the antepenultimate joint. Front rather narrow; vertex but little developed. Legs very long and slender, finely pubescent; tibiæ without spurs; ungues simple; no empodia. Male forceps not large, in the dry specimen showing two obtuse, fleshy lobes. Valves of the ovipositor small, slender, arcuated. Auxiliary vein nearly as long as the first longitudinal vein, joining the costa in an acute angle; the subcostal cross-vein at some distance before the tip. The second longitudinal vein arises at some distance before the middle of the wing, with a strong curve backward; nearly opposite the distal end of the discal cell, it gives off an oblique branch to the costa; marginal cross-vein long and oblique, sometimes joining the proximal end of the anterior branch. The beginning of the third vein in the same straight line with the first section of the second vein, terminating in the fourth vein at the proximal end of the discal cell. Anterior cross-vein wanting. Anal cell narrowed in the margin. Seventh vein very short.

This singular genus is remarkable, if my interpretation of the neuration is correct, in the entire absence of the first posterior cell, the second submarginal cell lying in contact with the discal cell and the second posterior cell, through the absence of the small cross-vein and the greater part of the third vein. It is difficult to see how there can be any other interpretation, as the branch of the second vein that takes the place of the small cross-vein cannot possibly be that cross-vein, for, in that case, it would arise from the second vein—an impossibility. Furthermore, this interpretation seems probable from a study of the neuration in *Paratropesa*, where the first posterior cell begins at the outer end of the discal cell. The relationship seems to be with that genus, but I cannot agree with Osten Sacken in considering the anterior branch of the second vein an adventitious cross-vein. There are two submarginal cells present, as in *Gonomyia*. Aside from the fact that there are only three posterior cells present, which may or may not be a generic character, the shortness of the seventh longitudinal vein is sufficient for the separation of the genus.

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The foregoing, without change, was written in the belief that our specimens represented a new genus. A more careful search of the literature, however, revealed to my surprise the congenerousness of the species, especially *M. albitarsis*, Dol., included in the genus *Mongoma*. The species hitherto made known—seven or eight in all—are from Java, Sumatra, the Philippine Islands, Borneo, Madagascar, and Southern Africa. Its occurrence in the western continent is of great interest.

1. *Mongoma manca*, n. sp.

♂, ♀. Front and basal joints of the antennæ brownish red; flagellum of antennæ and the palpi brown or black. Thorax, light brownish-red, the metanotum sometimes a little darker, and the pleuræ more yellow. Halteres yellow. Abdomen brown or brownish-red, the terminal segments more reddish. Legs brownish; base of femora and the distal joints of the tarsi more yellowish. Wings nearly hyaline; stigma small, rounded, brownish. Length 7–8 mm.

Six specimens. Forest, 2000 feet, July.

2. *Mongoma pallida*, n. sp. (Pl. X., fig. 67, wing.)

♂, ♀. Wholly light yellow, the front and outer joints, the antennæ, only, brown or brownish; the legs a little darker. Wings pure hyaline, with light-coloured veins; no stigma; the distance between the junction of the marginal cross-vein and the origin of the anterior branch of the second vein greater than in *M. manca*, nearly as great as the length of the anterior branch itself. Length 5 mm.

Four specimens. 1000–1500 feet. In addition to the smaller size, much lighter colour, and more hyaline wings, the species will be readily distinguished by the shorter outer submarginal cell. In the present species, its inner end, in all the specimens, is opposite the inner end of the second posterior cell; in *M. manca* the proximal end is, in every case, at a considerable distance proximad to that of the posterior cell.

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ERIOPTERA.

Meigen, Illiger's Mag., ii., 1803.

1. *Erioptera caloptera.*

Erioptera caloptera, Say, Journ. Acad. Nat. Sci. Phil., iii., 17; Compl. Wr., ii., 44; Wiedemann, Auss. Zw. Ins., i.. 23; Osten Sacken, Proc. Acad. Nat. Sci. Phil., 1859, 226; Monoghr., iv., 161, pl., iv., f. 15.

Hab. Atlantic States; Kansas; Colorado; Canada; Cuba.

One specimen, which scarcely differs from others from Kansas.

2. *Erioptera annulipes*, n. sp.

♀. Legs conspicuously white and black annulate. Length 3–3½ mm.

Head brown or blackish. Antennæ brown, not longer than the mesonotum. Thorax and abdomen yellowish-brown, the latter posteriorly more yellow. Legs conspicuously white and dark-brown annulate, the femora, tibiæ, and tarsi each with three brown rings; a fourth brown ring on the femora is more or less indistinct. Wings nearly hyaline, the costa with four brown spots intercalated with as many white ones; the outer posterior margin also with alternating white spots.

Two specimens.

EPIPHRAGMA.

Osten Sacken, Proc. Acad. Nat. Sci. Phil., 1859.

1. *Epiphragma sackeni*, n. sp. (Pl. X., fig. 68, wing.)

♂. Head black in ground-colour, opaque yellowish-grey pollinose; brown on the lower part of the broad front. First two joints of the antennæ brown, the third and fourth yellow; remainder of the antennæ blackish; if bent back, the antennæ would reach about to the root of the wings. Mesonotum ochraceous, with slender, dark-brown markings. Metanotum deep brown or blackish, somewhat darker than the pleuræ. Halteres yellow, the knob brownish. Abdomen dark brown, the venter yellowish.

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Basal half of the femora yellow; the distal part with two dark-brown bands, and two, narrower, yellow bands, the second yellow band at the tip; tibiæ and tarsi brownish, with a narrow yellow band at the base of the tibiæ (middle and front legs wanting). Wings with uniform brown spots, located as in the figure; separated from the infuscation of the rest of the wing by narrow, hyaline, or light-yellow margins. Length 7 mm.

One specimen. 1500 feet.

Tipula.

Linne, Anim. per Sueciam observata, 1736.

1 *Tipula subinfuscata*, n. sp. (Pl. X., fig. 69, wing.)

♂. ♀. Antennæ black, or black and yellow; wings uniformly subinfuscated. Length 12 mm.

Antennæ in the male black, the proximal three or four joints yellow, about as long as the front femora; in the female, yellow, with the proximal end of the sixth and following joints black, and only about as long as the mesonotum. Thorax light yellow, the mesonotum brownish. Front, rostrum and palpi yellow, the last a little brownish at the tip. Halteres brown. Abdomen reddish-yellow, the lateral margins of all the segments, a part of the sixth segment, and all of the seventh, black (in the female specimen the abdomen is wanting). Legs yellow, the tip of the tibiæ, and the tarsi for the greater part, black. Wings uniformly tinged with brown, the costal cell and the stigma pale brown.

I can find no description which will apply to this species, though that of *T. infuscata*, Loew, will nearly do so. The colour of the antennæ in the female will at once distinguish the two.

Pachyrrhina.

Macquart, Hist. Nat. Dipt., i., 88, 1834.

1. *Pachyrrhina elegantula*, n. sp. (Pl. X., fig. 70, wing.)

♀. Stripes of the mesonotum brownish red, lateral margins with three opaque black spots. Length 14 mm.

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Front and rostrum light opaque orange-yellow, the former with an angular spot posteriorly, not continued into a stripe, subshining bluish. Antennæ yellow, the terminal joints brownish. Pronotum light opaque yellow in the middle, black on the sides; mesonotum opaque yellow, with light brownish-red, shining stripes; the lateral ones curve strongly outward in front, and terminating in an opaque black spot; a similar spot just back and below these, and a third velvety black spot immediately above the root of the wings, extending narrowly into the suture. Scutellum shining brownish-red. Metanotum yellow, with a stripe of the colour of the scutellum, expanded triangularly behind. Pleuræ light sulphur-yellow, with shining reddish spots. Abdomen light opaque orange-yellow; the first four or five segments with inconspicuous brownish bands. Knob of halteres brown. Coxæ, femora, and tibiæ yellow, the two latter black at the tip; tarsi black, the proximal joints somewhat yellowish. Wings with a brownish-yellowish tinge; costal cell yellow; stigma pale brown.

♂. Antennæ darker, the basal three or four joints yellow. Markings of thorax; abdomen and legs somewhat darker.

One male and two females. The species seems nearest allied to *P. consularis*, O. S., but will be at once distinguished by the colour of the thoracic stripes and the additional black spots.

Polymera.

Wiedemann, Auss., Zw. Ins., i., 57, 1828.

1. *Polymera albitarsis*, n. sp. (Pl. X., figs. 71, part of antenna ♂; 71*a*, antenna ♀; 71*b*, wing.)

♂, ♀. Front, palpi and rostrum brown. Antennæ brown, the basal joints yellowish. Thorax brownish-yellow, the pleuræ in the middle blackish. Abdomen dark brown. Legs luteous, the base of the femora yellow; tarsi white, except the metatarsi of the two anterior pairs, the proximal end of the second joint of the same pairs, and of the metatarsi of the hind pair, which are brown. Wings distinctly tinged with brownish. Length 6–7 mm.

Four specimens. Hitherto, only South American species of this genus have been made known, from which the present species seems distinct. The male antennæ

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were originally described as having twenty-eight joints, and the true number, sixteen, was not known till specimens were examined by Loew. The joints in this sex are very closely united, and it is only by close examination that the number can be made out. From *P. fusca*, Wiedemann, and *P. obscura*, Macquart, which seems to be a distinct species, the present appears to be so closely allied, that the short descriptions will hardly distinguish them. However, Wiedemann figures the female antennæ as elongate, like those of the males, but with simple, not constricted joints. In the present species, the female antennæ are short, in fact not longer than the thorax, and are of the ordinary Tipulid structure; that is, the joints are oval, slightly hairy, and are easily distinguishable. The first joint is not cylindrical, and is not provided with short, closely-set hairs, as is described. The figure given by Macquart shows short and abundant hairs on the swellings of the male antennæ, very different from the long, delicate hairs of the present species.

Species Incertæ Sedis.

Two species of *Tipulidæ*, represented by single, more or less mutilated specimens, I cannot locate. I give figures herewith, which will, I believe, render the identification not doubtful. One of them (Pl. X., figs. 72 and 72*a*) possibly represents a new genus. The tip of the antennæ is broken off, otherwise the specimen is complete. If the antennæ are but 14-jointed, the species would be located in *Rhipidia*, from which, however, the structure of the male organs show distinct differences, and the antennæ are hardly sufficiently pectinated. If there are sixteen joints, Schiner's and Osten Sacken's tables will carry the species to *Antocha*. This genus and *Thaumastoptera* are almost the only ones in this group which I do not know. Still, the neuration is sufficiently distinct to render its location with *Antocha* practically out of the question.

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DIXIDÆ.

Dixa.

Meigen, Syst. Beschr., i., 216, 1818.

1. *Dixa clavulus*, n. sp. (Pl. X., fig. 73, wing.)

♂. Head black, lightly greyish-pruinose; palpi and rostrum a little reddish. Antennæ black, the basal joints somewhat reddish. Thorax yellow, the mesonotum with three dark-brown stripes, the median one abbreviated posteriorly, and divided by a slender line; the lateral ones begin a little before the termination of the median one. Scutellum and mesonotum brownish-yellow. Abdomen dark-brown. Legs brown or yellowish-brown; the tip of the hind tibiæ and their tarsi blackish; the femora, for the greater part, yellowish; hind tibiæ thickened at the tip. Length of body 2 mm., of wings 3 mm.

Four specimens. This species must be closely allied to *D. clavata*, Loew, from Massachusetts, and I was, at first, inclined to identify it with it. It differs from the description, however, in several important points. The pleuræ are immaculate yellowish, the legs are darker coloured, and the wings are uniformly tinged with brownish, not hyaline, with markings.

RHYPHIDÆ.

Rhyphus.

Latreille, Nat. Hist., etc., xiv., 291, 1804.

1. *Rhyphus dolorosus*, n. sp. (Pl. X., fig. 74, wing.)

♀. Front and occiput black, somewhat greyish-pruinose. Mesonotum yellow with three brown stripes; wings broadly clouded on the distal and posterior margin, with two conspicuous brown spots in front, and narrow brown clouds on the cross-veins. Length of body 4 mm., of the wings 5 mm.

Front a little narrower below, the ocelli situated wholly in front of a line drawn through the angles of the eyes. Face more yellowish. Eyes reaching to the oral margin below. Palpi and proboscis black. Antennæ black, the two basal joints yellowish. Mesonotum opaque yellow with three brown or brownish-red stripes, the middle one abbreviated posteriorly the lateral ones in

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front; bristles very short, hair-like. Pleuræ yellow, with obscure brownish spots. Metanotum and halteres yellow. Abdomen deep brown or black, the basal segments with obscure yellow markings. Legs yellow; the tip of hind femora and tibiæ, and the distal joints of all the tarsi brown or blackish. Wings broadly clouded with brown at the tip and along the posterior margin, the inner portion subhyaline; two dark-brown spots in the marginal cell, separated by a yellow spot; costal cell yellowish; the cross-veins with narrow, dark-brown clouds.

One specimen. Allied to *R. fenestralis*, but differs in the abdomen and wings.

STRATIOMYIDÆ.

Sargus.

Fabricius, Ent. Syst. Suppl., 566, 1798.

1. *Sargus lucens.*

Sargus lucens, Loew, Centur., vii., 11.—Cuba.

Six specimens.

Hermetia.

Latreille, Hist. Nat. des Crust. et Ins., xiv., 338, 1804.

1. *Hermetia illucens.*

Musca illucens, Linné, Syst. Nat., ii., 979. (For remaining synonymy, see Osten Sacken, Cat. 46, and Williston, Trans. Amer. Ent. Soc. xv., 245.)

Hab. Southern United States; Mexico; Brazil; West Indies.

Eight specimens. Quite like others from the United States and Brazil.

Pelagomyia.

Williston, Manual. N. A. Diptera, 48, 1896.

1. *Pelagomyia albitalus*, n. sp. (Pl. X., fig. 75, head of ♂.)

♂. Front and face deep shining green, with long and abundant, erect black hair. Eyes thickly pilose. Antennæ black; second joint a little shorter than the first, the third joint about twice the length of the first two together, gradually tapering, the annuli

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closely set together; style distinctly differentiated, and extending at an angle with the third joint; its first joint small; second joint thickened, spindle-shaped, finely and densely hairy, terminating in a slender bristle about as long as the thickened portion of the style; altogether, the style is shorter than the third antennal joint. Thorax shining metallic, deep green, with blue reflections and erect black pile. Abdomen elongated, of equal width, black or brownish black, the second, third, and fourth segments with a narrow posterior margin of golden or silvery pubescence, forming an interrupted band. Femora black; tibiæ light yellow with a broad brown ring beyond the middle; the hind pair with the distal two-thirds brown; tarsi light yellow or yellowish-white, the distal three joints of the four anterior ones, the tip of the metatarsi, and the remaining joints brown or brownish. Wings hyaline on the basal anterior portion; clouded behind, and blackish on the outer half. Length 9 mm.

Two males and one female. The female differs in being of a larger size (12 mm.) in the absence of metallic coloration, in the more reddish-brown colour of the abdomen, and in the lighter coloured wings. It may be an immature specimen. I at first identified this genus as *Chromatopoda*, Brauer, but it will be at once distinguished by the structure of the second antennal joint.

Aochletus.

Osten Sacken, Biol. Centr. Amer. Dipt., 38, i., 1885.

♂. Holoptic, the upper eye-facets moderately enlarged and sharply distinguished from those of the lower portion. Antennæ situated a little below the middle of the eyes in profile, shorter than the head; annuli of the third joint closely united, the first one small and short, the sixth elongate and with several minute bristles at the tip. Scutellum with two slender spines. Abdomen slender, composed of five segments. Veins of the wings on the outer posterior part weak or evanescent, the beginning of the second and fourth ones arising from the discal cell apparent, the first and third only faintly indicated by folds.

1. *Aochletus bistriatus*, n. sp. (Pl. X., fig. 76, antenna.)

♂. Face black, moderately shining; on either side silvery pubescent. Antennæ black; the first and second joints, for the greater part, reddish. Mesonotum black, moderately shining;

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Explanation of Plate XI.

Fig. 80. *Leptogaster roederi*, wing.
81. *Geron senilis*, antenna.
82. *Psilocephala argentata*, antenna.
83. *Hybos dimidiatus*, wing.
84. *Syneches pusillus*, wing.
85. *Drapetis xanthopodus*, antenna, 85*a* wing.
86. „ *flavidus*, antenna, 86*a* wing.
87. *Pipunculus aculeatus*, wing, 87*a* antenna.
88. „ *politus*, wing.
88*a*. *Jurinia* species, antenna.
89. „ *apicifera*, antenna.
90. *Gonia pallens*, ♂ antenna.
91. *Phorocera puer*, ♂ head.
92. *Exorista nobilis*, ♂ head.
93. *Atrophopoda townsendii*, ♂ head and part of antenna, 93*a* ♂ tarsus, 93*b* ♀ tarsus, 93*c* wing.
94. „ *braueri*, ♂ head, 94*a* ♀ tarsus, 94*b* ♂ tarsus, 94*c* wing.
95. *Didyma calyptrata*, ♂ head.
96. *Degeeria nigriventris*, ♂ head.
97. *Beskia cornuta*, ♂ head, 97*a* wing.
98. *Rhynchodexia sororia*, ♂ head.
99. *Elachipalpus macrocerus*, wing.
100. *Trichopoda pennipes*, wing.
101. *Pœcilobothrus unguiculatus*, ♂ last joint of front tarsus.
102. *Paraclius filiferus*, tip of wing.
103. *Polymedon superbus*, ♂ head.
104. *Eutarsus sinuatus*, wing.
105. *Cœloglutus concavus*, wing.
106. *Xanthotricha cupulifera*, wing, 106*a* hypopygium.
107. *Achaleus sordidus*, ♂ wing, 107*a* ♀ wing.

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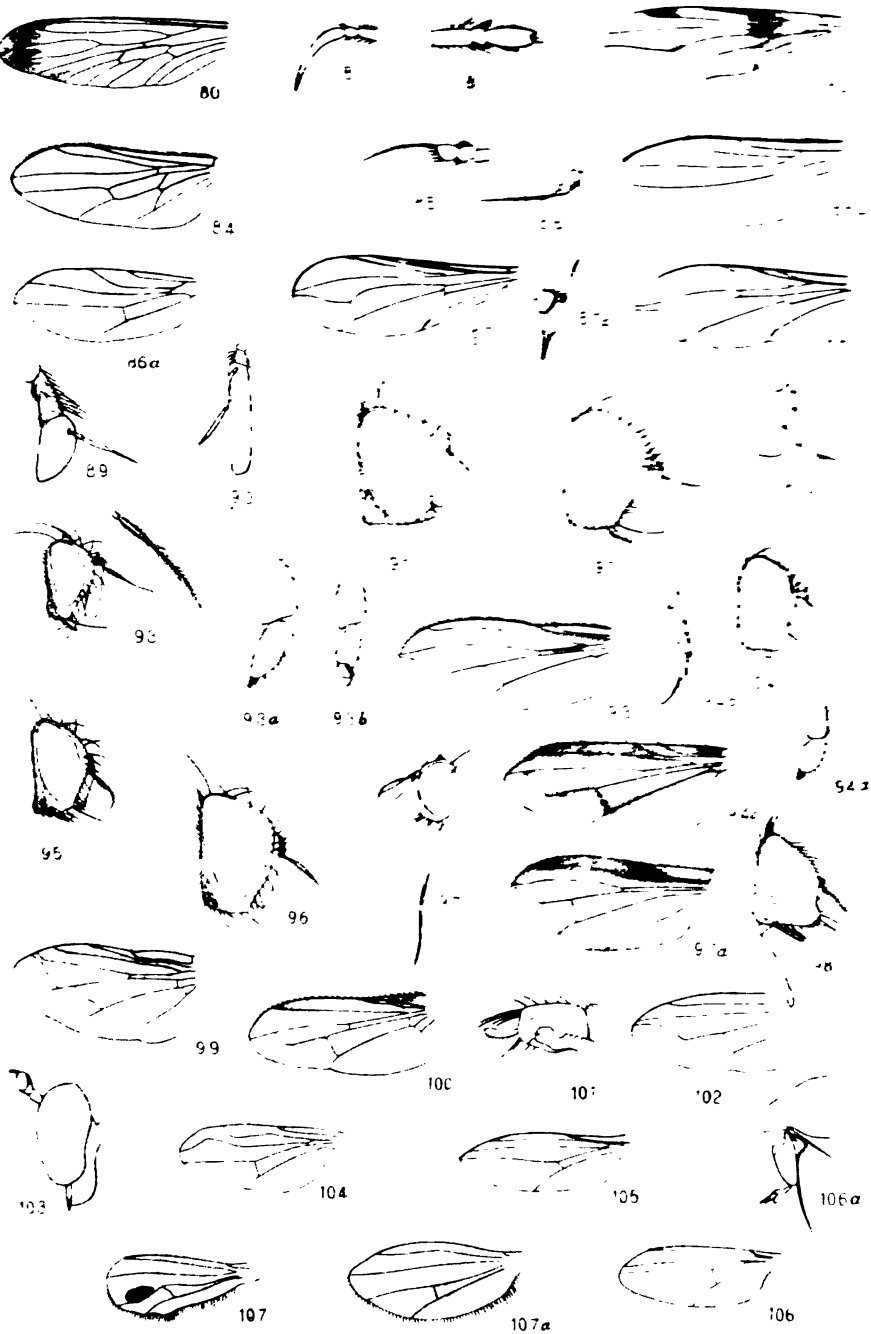

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finely pubescent; with two yellow stripes, acuminate in front, and connected with the yellow post-alar callosities behind. Scutellum wholly yellow. Pleuræ yellow, the mesosternum black. Abdomen black or dark-brown, with a red band across each of the three anterior segments. Legs yellow, the tarsi infuscated toward the tip. Wings hyaline. Length 5 mm.

One specimen. 1500 feet.

Cyphomyia.

Wiedemann, Zool. Mag., i., 3, 55, 1819.

1. *Cyphomyia lasiophthalma,* n. sp.

♂. Eyes markedly pilose. The small vertical triangle black; frontal triangle and face shining metallic black, densely clothed with white pile, intermixed with black hairs. Antennæ black, the base of the third joint red. The narrow inferior occipital orbits white pubescent. Mesonotum shining violet-black, with three stripes of white pubescence, and with long, erect, black pile. Scutellum like the mesonotum, with long black pile and white pubescence; spines as long as the scutellum, somewhat divergent, reddish at the distal end, and clothed with black pile. Pleuræ with white pile. Tegulæ yellow. Abdomen shining metallic blue, with erect black pile, and four sharply marked, white pubescent spots. Legs black; the knees and base of hind metatarsi reddish; four anterior metatarsi, except their tip, light yellow. Wings nearly hyaline.

♀. Antennæ a little longer, the third joint about equal to half the width of the head. Front and face shining blue-black, clothed with close-lying, nearly white pile, the face nearly bare in the middle. Occipital orbits a little broader than in the male, white pubescent. Pile of mesonotum and scutellum dusky, that on the spines white; the spines are wholly of the colour of the mesonotum, and are shorter than in the male. Abdomen, as usual, with six spots. Length 7 mm.

Two specimens. 1500 feet. The species is allied to *C. marginata,* Loew, one of the few known species with long-pilose eyes. The front of the female is narrow and without elevations of any kind.

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Chordonota.

Gerstæcker, Linn. Ent., xi., 311, 1857.

1. *Chordonota leiophthalma*, n. sp.

♂. Eyes bare, closely contiguous, the upper part with the facets markedly enlarged, those of the lower half small, the two sets separated by a distinct line. Occiput concave, wholly invisible from the side. Ocellar triangle small, black; frontal triangle small, silvery, the silvery pubescence extending a little way along the facial orbit. Antennæ red, the upper margin and the distal portion of the third joint black. Mesonotum black, with a strong purple reflection, beneath the short, dense, black pubescence; two narrow, silvery, or light golden, pubescent stripes on each side, and an indication of a fifth in the middle. Scutellum like the mesonotum and with silvery pubescence near its margin. Pleuræ black. Abdomen shining metallic blue or purple, the fourth and fifth segments each with a spot of silvery pubescence on each side. Legs black, the metatarsi a little reddish. Wings tinged with blackish, the stigma luteous. Length 7 mm.

Two specimens. This species, structurally and in appearance, resembles *C. nigra*, Willist., but will be at once distinguished by the bare eyes, distinctly vittate mesonotum, and shorter pile.

Species Incertæ Sedis.

A small species, represented by a fragment only, belonging among the Pachygastrinæ, perhaps to *Pachygaster*.

TABANIDÆ.

Tabanus.

Linné, Fauna Suecica, 1761.

1. *Tabanus alcis*, n. sp. (Pl. X., fig. 77, antenna.)

♀. Brown; wings with brown spots; upper angle of the third antennal joint drawn out into a long process. Length 13–14 mm.

Eyes bare; no ocellar tubercle. Front narrow, cinnamon-brown; callus very small, shining red. Antennæ yellow, with black hairs; slender; the upper process of the third joint drawn out into a long process, the annulate portion slender, and curved. Face of the colour of the front, bare. Palpi yellow, with black hairs. Mesonotum cinnamon-brown, or darker brown, with two

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slender yellowish stripes. Pleuræ more whitish. Abdomen brown; on the sides in front yellow; the segments with a median, posterior triangle of light golden hair, which extends outward, forming a narrow hind border. Legs reddish or brownish-yellow. Wings subhyaline, the anterior part to the tip of the second vein luteous; the distal costal portion and the posterior margin clouded with blackish; a large spot covering the cross-veins at the outer part of the discal cell, and extending into the first posterior cell, and another large one on the furcation of the third vein, reaching to the costa, brown.

Three specimens. It is not impossible that this is the same as *T. parallelus*, Walker.

2. *Tabanus*, sp. (Pl. X., fig. 78, antenna.)

♂. Frontal triangle yellow; face brownish-red, thickly grey pollinose; palpi light yellow; all clothed with white hair. Antennæ yellow; third joint angular above, but not drawn out into a process. Mesonotum black, not shining, greyish pollinose, and with yellowish-white pile; pleuræ ochraceous yellow, with white pile. Abdomen brownish-red and brown, opaque; the segments with a narrow, light yellow, hind border. Legs yellow; tarsi infuscated distally. Wings hyaline; the furcation of the third vein with a stump. Eyes bare; no ocelli. Length 10 mm.

One specimen.

LEPTIDÆ.

Chrysopila.

Macquart, Dipt. du Nord de la France, 1827.

1. *Chrysopila ludens.*

Chrysopila ludens, Loew, Wien. Entom. Monatschr., v., 34.

Hab. Cuba (Loew).

Six specimens agree sufficiently well with the description of this species. In those that are well preserved, there is a golden pubescence on the abdomen, and the hind femora may be in large part black. With these specimens, there are several others in which the thorax is yellow, with the mesonotum brownish. The abdomen, in all the specimens, is in large part black.

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2. *Chrysopila atra*, n. sp. (Pl. X., fig. 78*bis*, wing.)

♂. Deep black; wings hyaline, with two dark-brown spots on the costal margin. Length 5 mm.

Deep black throughout, with black pile. Face cinereous pruinose. Mesonotum and abdomen opaque velvety. Wings hyaline, the apical third in front clouded; the stigma, a spot across from the costa to the second vein on the distal part of the auxiliary vein, and a cloud on the humeral cross-vein, dark-brown.

One specimen.

ASILIDÆ.

Ommatius.

Wiedemann, Auss. Zw. Ins., i., 418, 1828.

1. *Ommatius marginellus.*

Ommatius marginellus (Fabricius), Wiedemann, Auss. Zw. Ins., i., 421; Dipt. Exot., i., 223, pl. vi., fig. 5; Macquart, Dipt. Exot., i., 2, 134; Schiner, Verh. zool. bot. Gesellsch, 1866, 682.

? *Ommatius tibialis*, Say, Journ. Acad. Phil., iii., 49; Compl. Wr., ii., 63; Wiedemann, Auss. Zw. Ins., i., 422; Williston, Trans. Amer. Ent. Soc. xi., Pl. ii., fig. 12 and xii., 76.

Ommatius Saccas, Walker, List, ii., 474.

Ommatius vitreus, Bigot, Ann. Soc. Ent. Fr., 245, 1875.

Hab. West Indies; South America; ? North America.

Thirty specimens. The only difference which these specimens present from others, both male and female, from Brazil, are the yellow bristles of the hind femora. Others in my collection from San Domingo agree in this respect with the Brazilian ones. That all are of the same species, I have no doubt. That *O. tibialis* is the same species, I am not so confident. The distinctive characters pointed out by Schiner, though I do not think that they are of much importance, are present in North American specimens. The posterior part of the mesonotum and the scutellum also seem to be more hairy in *O. tibialis*. In all the specimens, the colour of the legs

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varies much. There are no structural differences in any of the specimens, and, in some of the San Dominican specimens, the colour of the bristles of the hind femora varies. Taking the above facts into consideration, I believe that all the names above given, and probably others, represent a single species of wide distribution. *O. tibialis* occurs through all of the Eastern United States, as far as the Rocky Mountains.

ERAX.

Macquart, Dipt. Exot., i., 2, 107, 1838.

1. *Erax rufitibia.* (Pl. X., fig. 79, wing.)

Erax rufitibia, Macquart, Dipt. Exot., 3rd Suppl., 27. Pl. ii., fig. 11; Walker, List, vii., 623; Roeder, Stett. Ent. Zeit., 339, 1885.

Hab. Brazil; San Domingo; Porto Rico.

♂. Front and face light yellowish-grey; gibbosity of the face with numerous black bristles and yellowish-white hairs. Mesonotum grey, with three broad black stripes, narrowly separated, the lateral ones narrowly divided into three spots, the hindmost one of which is small; the middle one with an indication of a middle stripe in front. Abdomen black, not shining; hair yellow, sparse and reclining, save on the anterior two segments; lateral margins opaque light-grey; sixth and seventh segments silvery; hypopygium large, black. Wings with the costal border thickened; furcation of third vein beyond the base of the second posterior cell. Legs black; tibiæ except the tip, red. Length 18-20 mm.

Two males and three females, the latter showing scarcely any differences, save the usual sexual ones.

LEPTOGASTER.

Meigen, Illiger's Mag., 1803.

1. *Leptogaster roederi*, n. sp. (Pl. XI., fig. 80, wing.)

♂, ♀. Antennæ yellow, with the distal half of the third joint black; wings blackish at the tip. Length 8–9 mm.

Front brown. Face and mystax yellow. First two antennal joints and the base of the third yellow; remainder of the third joint and the arista black; third joint a little shorter than the first two together, the arista a little longer than the three joints

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together. Mesonotum shining, dark pitchy, a little more yellowish on each side in front; on the posterior part subopaque; sides lightly pollinose. Pleuræ brown and yellowish, light yellow pollinose. Abdomen black or brown, the posterior margin of each segment whitish, the hind angles reddish. Coxæ light yellow; femora black or brown, with the base and a preapical ring red or yellow; anterior tibiæ yellowish, with the distal part yellow; hind tibiæ black or deep brown, with the proximal part yellow; anterior tarsi yellow; hind tarsi black. Wings pure hyaline, with the tip blackish. Empodium about half the length of the claws. Occiput without bristles.

Two specimens. In one the colours throughout are not so deep, and the tip of the wing is cinereous.

HOLCOCEPHALA.

Jænnicke, Abhandl. Senckenb. Gesellsch, vi., 1867.

Two male specimens of a species related to *H. calva*, Loew, but with the legs nearly black, and the abdomen not clavate.

BOMBYLIIDÆ.

GERON.

Meigen, Syst. Beschr., ii., 223, 1820.

1. *Geron senilis*. (Pl. XI., fig. 81, antenna.)

Geron senilis, Fabricius, Ent. Syst., iv., 411; Syst. Antl., 135, *Bombylius*; Wiedemann, Auss. Zw. Ins., i., 357; Macquart, Dipt. Exot., Suppl., i., 119.

Hab. West Indies; Texas.

One male specimen, agreeing very well with Wiedemann's description.

THEREVIDÆ.

PSILOCEPHALA.

Zetterstedt, Ins. Lapp., 525, 1840.

1. *Psilocephala argentata*. (Pl. XI., fig. 82, antenna.)

? *Thereva argentata*, Bellardi, Saggio, ii., 90; Roeder, Stett. Ent. Zeit., 1885, 340.—Mexico, Porto Rico.

♂. Black; abdomen silvery white, except a large spot on the anterior angles. Length 6–8 mm.

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Frontal triangle shining black, its inferior corners and the face opaque silvery. Antennæ black; third joint on the inner, basal portion yellowish. Cheeks, immediately below the eyes, shining black, with black pile. Beard white; occiput silvery grey. Mesonotum with dusky yellowish pile, and black bristles; on the sides, shining black; in the middle, with two broad, narrowly separated, opaque, olivaceous grey stripes; a narrow stripe between the two, brown. Scutellum shining black, its apical margin opaque grey, and with four bristles. Pleuræ opaque greyish-white, with white hair. Halteres brown. Abdomen silvery white, when viewed from above; the brown or black ground-colour predominant, when seen from behind; the first segment in the middle, and a large spot on the anterior angles of the following segments, extending nearly to the posterior margin, black. Legs, for the greater part, sordid yellow; femora black; the tip or distal portion of the tibiæ, and the distal joints of all the tarsi, blackish. Wings nearly hyaline; stigma elongate.

Four specimens. Seashore.

EMPIDIDÆ.

Hybos.

Meigen, Illiger's Mag., ii., 1803.

1. *Hybos dimidiatus.* (Pl. XI., fig. 83, wing.)

? *Hybos dimidiatus*, Loew, Wien. Entom. Monatschr., iv., 36 (*nec* Bellardi).

Hab. Cuba.

There are, in the collection, some twelve or more specimens, which I refer very doubtfully to this species. In the most typical, the chief differences from the description are: The presence of black hairs on the thorax, the darker colour of the front femora, and the light-brown colour of the basal portion of the wings. The distal portion of the wings is not hyaline, or even cinereo-hyaline, but is distinctly infuscated. In some of the specimens the wings are nearly uniform in colour throughout.

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Syneches.

Walker, Dipt. Saunders, 165, 1856.

1. *Syneches pusillus.* (Pl. XI., fig. 84, wing.)

Syneches pusillus, Loew, Centur., i., 25.

Hab. Illinois, New York.

Two specimens agree with this description. I have no specimens from the United States for comparison.

Drapetis.

Meigen, Syst. Beschr., iii., 1822.

1. *Drapetis xanthopodus,* n. sp. (Pl. XI., figs. 85, antenna; 85*a*, wing.)

♂, ♀. Deep shining black; legs yellow; first posterior cell a little narrowed at the extremity. Length 2–2½ mm.

Antennæ, front and proboscis black; eyes contiguous below the antennæ; front very narrow or subcontiguous in both sexes. Occiput black, with black pile. Thorax and abdomen shining black, the mesonotum a little metallic; pile short, dusky. Legs, including the coxæ, yellow, the tarsi more or less infuscated; hind metatarsi brown or brownish; elongate and somewhat thickened; hind tibiæ with a short terminal spur; all the femora stout. Wings cinereous hyaline; third and fourth veins gently convergent near the margin.

Ten specimens.

2. *Drapetis flavidus,* n. sp. (Pl. XI., figs. 86, antenna; 86*a*, wing.)

♂, ♀. Yellow or reddish-yellow; head and the fourth abdominal segment black. Length 2–2½ mm.

Occiput, vertical triangle and front black. Eyes contiguous below the antennæ, subcontiguous above. Antennæ yellow, the third joint sometimes brownish. Thorax reddish-yellow, the mesonotum shining, with light-coloured hair and bristles. Abdomen yellow, opaque, the fourth segment and the hair black. Legs light yellow, with light-coloured hair and bristles; hind tibiæ in the male with a stout curved spur at the tip; hind femora less thickened than the middle ones; the front pair considerably thickened. Wings hyaline; the outer portions of the third and fourth veins parallel or very slightly divergent.

Numerous specimens.

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DOLICHOPODIDÆ.*

Of this family, the collection contains forty-six species, of which five only can be recognized as previously described. The study of so much material throws an interesting light on the geographical distribution of the genera. The entire absence of *Dolichopus*, of which the continent of North America contains nearly a hundred species, strongly emphasizes the fact that the genus is limited to the temperate and colder regions. On the other hand, more than half of the species in the present collection belong to the group which may be termed the *Chrysotinæ*, embracing *Chrysotus*, *Diaphorus*, and several smaller genera, while this group is represented on the continent by a considerably smaller proportion.

The discovery of a second species of the peculiar genus *Polymedon*, having identically the same habits as the Californian species, is a matter of great interest.

In the description of new species, the aim has been to give a careful review of the generic as well as specific characters in those not infrequent cases where there was possibility of an erroneous generic determination. The genera of *Dolichopodidæ* are, at least in part, in need of thorough revision, and several new ones must yet be erected for North American forms. Unwilling to undertake what should be the work of a more experienced hand, I have avoided, as far as possible, the establishment of new genera in the present article.

I am under the greatest obligation to Professor Williston, not only for the privilege of undertaking this work, but for the use of books and other valuable assistance.

Gymnopternus.

Loew, Neue Beitr., v., 1857.

1. *Gymnopternus ruficornis*, n. sp.

♂. Face of moderate width, white pollinose; front blue-green, with white dust below; cilia of inferior orbit white. Antennæ red, short, apex of third joint infuscated, the dorsal arista slightly pubescent. Thoracic dorsum bright green; a blackish-bronze

* By Professor J. M. Aldrich.

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stripe above the base of each wing, before and below this a spot with a silvery reflection when viewed from above; pleuræ dark green, in part black, with grey dust. Cilia of tegulæ black, halteres yellow. Abdomen bright green above, the sides below white-dusted, the hairs everywhere black and rather coarse; at the tip of the abdomen are two bristles, as long as two segments; hypopygium blackish-green, the lamellæ rounded, yellow, with pale brown margin fringed with yellow bristles. Fore and hind coxæ yellow, the former with very long black bristles and black hairs, the latter with a large and a smaller lateral bristle close together; middle coxæ brown on the basal half; femora and tibiæ light yellow, the fore tibiæ with a row of irregular but distinct bristles on the front side; the fore tarsi are pale to the extreme tip; middle and hind tibiæ with erect and conspicuous bristles; they are gradually infuscated from tip of first joint. Wings rather narrow, hyaline, the fourth vein converging towards the third, toward the tip close to, and nearly parallel with it.

♀. Face nearly twice as wide, white; no long bristles at tip of abdomen; otherwise substantially like the male.

Length 1·6 mm.; of wing, the same.

One male, one female.

Pœcilobothrus.

Mik. Dipt. Untersuch., 1878.

1. *Pœcilobothrus unguiculatus*, n. sp. (Pl. XI., fig. 101, last joint of ♂, front tarsus. Pl. XII., fig. 116, tip of wing.)

♂. Face very wide, below the suture with two lateral convexities separated by a narrow groove; colour dark brownish-green, with dense brown pollen, which appears lighter in certain directions. Palpi brown, with yellow tips; proboscis large, blackish. Front concave, shining violet in the middle, about the edges blackish. Antennæ brownish-black, the under part a little reddish; third joint ovate, a little pointed in an upward direction; arista nearly basal, short, distinctly feathered. Cilia of the inferior orbit white. Thorax bronze-green, not very shining; acrostichal bristles in two rows; the two rows of interior dorsal bristles (Mik) are inserted upon slender longitudinal shining blue lines, expanded posteriorly. The posterior margin of the dorsum is in the form of a thin projection, running around from the root of one wing to that of the other; above this the surface is considerably dusted. Scutellum bare, coppery. Pleuræ greenish, with white pollen.

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Cilia of tegula black. Tegulæ and halteres deep yellow. Abdomen olivaceous, slightly shining, on the sides shining green, and ventrally white pollinose. Hypopygium free and rather large, but sessile; colour black, a little dusted on the sides, the lamellæ are brown, yellowish at base, rather long and narrow, with rounded corners and a fringe of long black bristles all the way around except basally. All the coxæ brown, their tips yellow; femora yellow, tibiæ brownish-yellow, the hind knees brown. Tips of front tibiæ light yellow; first joint of fore tarsus of the same colour for two-thirds of its length, the remainder of the tarsus brownish-black. The joints beyond the first are short, and all are somewhat thickened; the last is rather long, and bears a little prominence on the underside near the base; the claw on the inner side is greatly enlarged, and bends back across this prominence as a straight spine, forming a grasping organ; beyond this its point curves laterally, the other claw and the pulvilli are nearly normal, but the latter are inserted a little toward the side instead of exactly at the end; the other tarsi normal, brownish-black beyond the first joint, which is short in the hind foot. Middle and hind tibiæ a little infuscated at the tip. Wings a little brownish, more so along the veins, costa a little thickened in its first part; the fourth vein makes a gradual curve forward throughout its last section, the convexity behind (see figure).

♀. Face wider and more prominent, the two convexities uniting below. Pollen more greyish. Palpi larger. Antennæ more yellowish below. Front tibiæ yellow with brownish tip, their tarsi simple, coloured like the others. Costa very much thickened before the end of the first vein. In one of my females each posterior cross-vein has a short stump on the exterior side near the middle.

Length 4–4·5 mm.; of wing, 4 mm.

Four males and four females. May.

Hercostomus.

Loew, Neue Beitr., v., 1857.

1. *Hercostomus latipes*, n. sp. (Pl. XII., fig. 111, tip of wing.)

♂. Face very narrow in the middle, above and below a little wider, with a median groove almost the whole length; in colour yellowish-brown, with thick silvery pollen. Palpi and proboscis yellow or a little brownish. Front shining green. Antennæ red; third joint brown, oval, slightly pointed, with a dorsal, moderately pubescent arista. Cilia of inferior orbit white. Thorax shining

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green, sometimes coppery, more so along the front margin. Small humeral bristles (Mik) numerous. Viewed from above, there is a silvery pollinose spot behind the humerus, and another behind the root of the wing. Scutellum coppery. Pleuræ mixed light and dark green, white-dusted. Tegulæ yellow, their cilia black. Abdomen coppery, on the sides more green, and ventrally somewhat white-dusted. Hypopygium large and long, yet scarcely pedunculated; the lamellæ proper are very small, yellow; the outer basal portion of each gives rise to a stout claw, twice as long as the lamella itself, black except a little at base, and curving upward toward the venter. A row of black bristles runs along the outer side of the claw two-thirds of the distance to the tip. Coxæ, legs, and feet wholly yellow, the last gradually infuscated toward the end. The fore coxæ have three large bristles, numerous black hairs, and a few smaller bristles. Middle coxæ with hair and bristles. Hind coxæ with the usual bristle. Fore tarsi widened from near the tip of the first joint, the under surface destitute of the customary black hair, therefore resembling a broad yellow sole. All the joints beyond the first are shorter than usual. Hind metatarsi shorter than following joint. Wings subhyaline, of slender outline. Fourth vein converging with the third in its last section, less so near the tip, ending distinctly before the apex. Posterior cross-vein at right angles to the long axis of the wing.

♀. Face wider, less narrowed in the middle, without groove; but little white pollinose, except on the prominent lower part, the remainder more greenish or brownish. Palpi a little larger, each with a minute bristle as well as fine hairs. The black spot overlying the transverse suture on each side of the thorax is very large, rather more so than the male. In one immature specimen the coppery colour is but little noticeable, leaving the abdomen and scutellum almost pure green.

Length 3–3½ mm.; of wing, 2½ mm.

Seven males and five females. 500–1500 altitude.

Pelastoneurus.

Loew, Neue Beitr., viii., 1861.

1. *Pelastoneurus lineatus*, n. sp.

♂. Front of moderate width, deep blue-green, shining. Face narrow in the middle, wider above and below, the ground colour brown, white pollinose. Palpi brownish-yellow, but little visible. Antennæ red, the first two joints short, the third large, oval, the

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apical half brown; arista dorsal, black, short, curved, distinctly feathered with sparse hairs. Cilia of inferior orbit white. Thorax shining green, with a bronze median line extending to the scutellum; anteriorly this line is enclosed by the acrostichal bristles; the small humeral bristles occupy a large area. The usual black colour accompanies the transverse suture on its upper side. In the proper light there is a silvery pollinose spot behind the humerus, another above the root of the wing, and a third behind it. Pleuræ blackish-green, white-dusted. Cilia of tegulæ black. Abdomen shining green, the sides of each segment silvery pollinose; each incisure is covered with a broad black band. Hypopygium black, exserted, the peduncle nearly as long as a segment of the abdomen; lamellæ small, dark-brown, with slender cilia, and on the upper side a row of equal short spines. Front coxæ yellow; middle ones brown, except the tips; hind ones yellow, with brown base. The front and middle ones have numerous black hairs; the former have several bristles, the latter only one of any size; hind coxæ with a single lateral bristle. Femora and tibiæ yellow; the middle femora with a row of delicate, short, light-coloured cilia below. Middle and hind femora with preapical bristle. Tarsi yellow, the middle and hind ones infuscated toward the tip. Fore pulvilli enlarged; hind metatarsi shortened. Wings slightly infuscated; the last section of the fourth vein bends gently forward, runs nearly straight for a distance, then is gradually recurved, ending near the third, which bends back at tip.

♀. Face wider and more yellowish; palpi and proboscis larger, yellow; third joint of antennæ smaller, scarcely infuscated; dorsal stripe wider; pulvilli normal; middle femora without cilia.

Length 4 mm.; of wing, 3·8.

Twelve males, five females. Sea level to 1500 feet. May.

2. *Pelastoneurus argentiferus*, n. sp.

♂. Face wide, concave to the suture, convex below, the concave portion shining green, except that the sides and lower part are somewhat silvery pollinose; this pollen covers the convex part. Palpi a little more yellowish. Front violet-green, scarcely shining. Antennæ blackish, the lower side reddish to a variable degree. Third joint short when fully developed, in some specimens shrivelled. Arista plumose, short, thick at base, rapidly tapering. Cilia of inferior orbit whitish. Thorax dark green, but little shining, acrostichal bristles in two rows, enclosing an area which is opaque as far as the middle. On each side of this, reaching to the inner

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dorsal bristles, is a more shining dark-blue area changing to violet posteriorly, and also spreading wider, so that most of the posterior half of the dorsum is deep violet. Viewing the specimen from above and behind, the light striking it from above and in front, four silver spots are visible—two just below the transverse suture, and behind the humeri, the others above and behind the roots of the wings. Scutellum bronze-green. Pleuræ green, white-dusted, tegulæ light-yellow, their cilia black. Abdomen bronze-green above, brighter green on the sides, below the middle of the sides white pollinose. Sixth segment entirely silvery pollinose, rather thin dorsally. Hypopygium large, blackish-green, considerably dusted, sessile, the lamellæ developed into rather long upcurved black processes, irregular in outline and with numerous black bristles of different sizes; at the base of each of these processes, below (dorsad) is a minute, yellowish, yellow-haired appendix,—this I take to be the true lamella, homologous with that organ in *Dolichopus*, while the process just described is a development from its upper basal corner, as occurs in some other species of the family. Fore coxæ yellow, at the base very slightly infuscated, with black hairs and bristles, middle and hind coxæ brownish-black, rather largely yellow at apex. Femora and tibiæ all yellow, the middle and hind knees very slightly infuscated, middle tibiæ slightly, the hind ones strongly infuscated at tip. Front tarsi only slightly and gradually infuscated, middle ones from tip of first joint, hind ones entirely, black. Wings brownish, the fourth vein bent forward in a very gentle curve and afterward nearly straight, ending close to the third before the apex.

♀. Face wider, in the middle somewhat brownish; palpi larger. Front blackish-brown, silver spots on thorax smaller, but still distinct. Abdomen somewhat coppery, often less bronze. Hind tibiæ less black at the tip.

Length 3·5 mm.; of wing, 3 mm.

Eleven males and five females. May, September; one specimen marked "Near sea by open stream."

Paraclius.

Bigot, Ann. Soc. Ent. Fr., 1859, p. 215.

1. *Paraclius filiferus*, n. sp. (Pl. XI., fig. 102, tip of wing.)

♂. Front of medium width, white pollinose on a green background. Palpi brownish-yellow, the extreme tips only visible, front

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rather wider than long, green, shining, with a violet reflection. Antennæ red; the third joint moderately large, ovate, with a blunt point, brown at the apex. Arista short, black, with moderate pubescence. Cilia of inferior orbit white. Thorax metallic-green. Acrostichal bristles rather large, in two rows, between which the colour is more coppery. A large area of small humeral bristles; on this area the colour is also somewhat coppery, and whitish dusted. Scutellum coppery. Pleuræ green, white-pollinose. Abdomen shining green, the posterior margins of the segments darker, lateral parts white-pollinose. Hypopygium large, exserted but sessile, the main part greenish-black coloured with light dust. Lamellæ yellow, brownish and rather pointed in front, with slender bristles; the upper basal corner is drawn out into a long hairy filament. All the coxæ, femora, and tibiæ red; middle coxæ with a lateral basal brown spot. Fore and middle coxæ with numerous black hairs and bristles. Lateral bristle of hind coxæ small. Middle and hind femora with a preapical bristle. Middle and hind tibiæ with large bristles arising from an outer glabrous stripe; their tarsi infuscated from tip of first joint. Hind metatarsus short. Wings a little brownish along the costal portion; venation normal; the curve of the fourth vein is almost a right angle. Posterior cross-vein somewhat curved, the convexity outward. Length 3·5 mm.; of wing, 2·8 mm.

Numerous males and females. Sea-level to 500 feet. May, September.

The female differs in having a wider and less dusted face, and somewhat darker tarsi and middle coxæ.

Leptocorypha, n. gen.*

♂. Face not reaching down to inferior corner of eye. Antennæ large; first joint with hair on the upper side, on the inner apical side projecting in a short cone; second joint transverse, attached to the first, so as to make an angle toward the side; third joint large, arista dorsal. The lower part of the joint drawn out in a point with pile on the front and lower sides. Palpi small. Acrostichal bristles in two rows. At a little distance from these, along the anterior dorsal margin of the thorax, begins an area of minute, closely-set bristles, reaching to the humeri, forming a distinctly limited triangular space on each side. Scutellum with two large

* λεπτός, narrow; κορυφή, apex.

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bristles and two small ones, its disk large. Abdomen short, for a male, tapering, the posterior margin of each segment, with a row of large bristles, which are longest on the last segment. Hypopygium disengaged, large, bent forward under the abdomen, the lamellæ rather small. Fore and middle coxæ with bristles and hair on the front side; the hind ones with two bristles on the outer side. Middle and hind femora with a pre-apical bristle. Hind metatarsus without bristles above. Second and third longitudinal veins straight, moderately divergent; fourth curving abruptly forward about the middle of its last segment, then gradually curving in the other direction, so that near the extremity it has a concavity behind, ending near the third vein. Posterior cross-vein a little more than its length from the margin.

1. *Leptocorypha pavo*, n. sp. (Pl. XII., fig. 112, wing.)

♂. Bright, metallic-green. Front wide, bright-green, a little concave. Face moderately narrow, wider above, covered with a smooth coat of whitish pollen. Palpi but little visible, yellow, with only one or two very minute bristles. Cilia of the inferior orbit whitish, no long hairs behind them. Occiput flat. Antenna large, reddish, first joint hairy above, broad at the end, drawn out on the inner corner into a cone; second joint transverse, hairy above; third joint very large. Viewed from the side, the last on its proximal, lower corner runs back entirely past the second joint. It is very high, rounded above, the arista dorsal rather short and stout with long pubescence, the lower distal portion of the joint drawn out into a long up-curved point, densely short, pilose on the inner and lower side. It reaches about to the middle of the arista, and beyond its end the latter has longer pubescence than before it. This third joint in outline is similar to that of some species of *Tabanus*. Thorax very bright metallic-green, somewhat whitish-dusted about the front part. The triangular areas of fine bristles above mentioned are on a bronze ground colour. Transverse suture very far forward, a black spot along its upper side. Scutellum long, nearly rectangular on its disk. Pleuræ mostly black, dusted lightly with white, around the base of middle and hind coxæ more or less yellow. That thin fold of the integument which, in many species of this family, begins just above the hind coxæ and expands upward, so as to partially embrace the first abdominal segment, is strikingly conspicuous in my specimens of this species. Halteres and tegulæ yellow. Cilia of the latter black. Abdomen bright-green, a narrow line of black along the posterior border of each segment, numerous black hairs and a

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posterior row of long bristles on each segment. The bristles of the fifth segment are a little longer than the segment. The exserted hypopygium is large, yellow throughout, except that the pedicel is brownish at the base, and the lamellæ are bordered with brownish. Bristles of the latter yellow, comparatively weak. Coxæ, femora, and tibiæ all yellow. Tarsi yellow at base, uniformly a little brownish toward the tip, on account of the covering of minute dark hairs. Pulvilli of ordinary size. Venation of the wings are in the description of the genus. Length 3·25 mm.; of wing, 3 mm.

Two specimens. St. Vincent, West Indies. Altitude, one 500 and one 1000 ft.

Anepsius.

Loew, Neue Beitr., v., 1857.

1. *Anepsius linearis*, n. sp.

♂. Thoracic dorsum shining green. Abdomen yellow and black. Legs yellow. Front very short, opaque, greyish. Face white, long, so narrow as to be almost invisible, still the eyes in well-preserved specimens are not contiguous ; just below the antennæ the face widens. Antennæ brownish or yellowish, long ; the first joint elongate, with a few hairs above ; the second and third of about equal size, the latter with a blunt point directed a little upward. Arista basal, bare, its first joint thick. Cilia of the orbit apparently wanting in all my specimens. Thorax bright green. Acrostichal bristles in two rows. Scutellum with one large and one minute bristle on each side. Pleuræ non-metallic, brown, toward the coxæ, and along the hind border yellowish. Halteres yellow. Cilia of tegulæ blackish, one or two yellow. Abdomen elongate, laterally compressed, black, non-metallic, second, third, and fourth segments across the dorsum yellow, except the fore and hind margins, venter yellow. Hypopygium small, scarcely exserted, the yellowish appendages minute. The hairs on the sides of the abdomen and on the venter are long and yellowish; on the dorsum they are short and brown. Coxæ and legs light yellow, only the hind tarsi slightly infuscated. Hairs of fore and middle coxæ sparse and delicate ; hind coxa with a single slender blackish lateral bristle. Fore tarsi one-and-a-half times as long as the tibiæ ; the pulvilli strongly enlarged. Middle tibia just below the knee, with two or three weak bristles in a group ; middle tarsi longer than their tibia. Hind femora with considerable hair, especially on the fore side ; hind tibiæ long, a little clavate,

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on the hind side below the middle with a row of small bristles. Hind metatarsus thickened, half as long as the following joint. Wings broad, yellowish; first and second veins far from the costa, fourth only gently curved, ending behind the apex, nearly parallel to the third. Posterior cross-vein long, almost twice its length from the border; second posterior cell large. Anal angle well developed.

♀. Much smaller than male. First joint of antennæ not elongated. Arista scarcely thickened. Face moderately narrow, parallel, the palpi and proboscis rather prominent, brownish. Abdomen usually not compressed, the dorsum wholly brownish-black; venter yellowish. Fore pulvilli not enlarged. Hind tibiæ as in the male, but the bristles fewer and shorter. Wings a little narrower.

Length, male, 2·6; female, 1·7 mm.

1000 to 1500 feet altitude. June. Numerous males and females.

Polymedon.

Osten Sacken, Western Diptera, 317, 1877.

This genus will have to be somewhat amended, as it should evidently include the following species. Baron Osten Sacken, in establishing it, had only one species, and consequently did not succeed in separating perfectly the generic and specific characters. The long cilia of the tegulæ, absence of acrostichal bristles, and large swelling of the costa, are characters that pertain only to the male of *P. flabellifer*, and are not generic. In the species here described, the hind metatarsi are in the male decidedly, in the female slightly, shorter than the following joint. Mr. Samuel Henshaw, at my request, kindly examined the types of *P. flabellifer* in the Museum of Comparative Zoology, Cambridge, Mass., and informs me that the hind metatarsi are not shorter than the following joint.

In the generic diagnosis, add "above" to the clause, "First joint of hind tarsi without bristles."

1. *Polymedon superbus*, n. sp. (Pl. XI., fig. 103, head of ♂. Pl. XII., fig. 113, wing; fig. 118, head of ♀; fig. 119, head of ♂.)

♂. Head large and high. Face wide; about half-way to the lower corner of the eye it is bent backward obliquely and grows

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gradually wider; beyond the lower corner of the eye it hangs down in a thin sheet, rounded below, about as far as its own width. The mouth parts hang down behind this. The whole face is silvery white. The proboscis and palpi are brown. Front somewhat excavated, deep metallic-blue, approaching violet in colour, very slightly dusted in the middle; along each side and across behind the ocelli white pollinose. Antennæ situated far above the middle of the face, directed strongly upward, as compared to the head alone; the latter, however, stands in an oblique position, strongly receding below, so that the antennæ are in reality directed straight forward. Immediately below their origin there is an angle in the profile of the head, and it begins to recede. First joint of the antennæ long and slender, yellow, with hairs above, the second projects considerably in a rounded curve over the inner edge of the third; it is also yellow. Third joint large rounded, a little longer than high, with a slight point. The arista is dorsal, thick, short, nearly bare, curved downward, brown in colour. Third joint of antennæ brown at the tip. Cilia of inferior orbit white. Occiput dark-green, dusted on each side. Dorsum of thorax shining metallic-green, in an oblique view, more blue or violet, darker and more bluish near the borders. Acrostichal bristles two rowed; a considerable area of small humeral bristles. The transverse suture is wholly bronze-black, which colour extends narrowly toward the anterior. Just below this is an elongate silvery pollinose spot, reaching forward to a point above the humerus. Pleuræ greenish-black, covered with bluish white dust. Tegulæ infuscated, with black cilia. Halteres yellow. Scutellum shining bluish-green, with a very large and a very small bristle on each side. Between the corner of the scutellum and the root of the wing is an excavated area, black, with a handsome silver spot. Abdomen bluish-green, with rather long bristles bordering the segments behind. When viewed in the proper light, each segment beyond the first is white pollinose on the anterior half, except in the middle of the dorsum. Toward the venter this pollen becomes dense and silvery. In the same light the posterior half of each segment is deep metallic violet-blue. Hypopygium large, exserted, turned under the venter. It is opaque-black, except some of the inner parts, which are brownish or yellowish. The lamellæ are large, parallelogram shaped, somewhat oblique, black. Along the upper margin of each are two slender curved yellow bristles, some distance apart. Fore and middle coxæ with a few hairs and bristles; hind ones with a single lateral bristle. Fore coxæ yellow, the others brownish-black. Femora and tibiæ yellow. Tarsi blackened from the middle of the first joint, middle tarsi a little

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crooked near the middle. Hind metatarsi three-fourths the length of the following joint, with a small but distinct bristle on the underside. Wings a little smoky; venation much as in *Tachytrechus* (Loew, Mon. N. A. Dol., Pl. III., 6); the third vein, however, is bent backward by a very gentle curve, beginning before the middle of the wing; the fourth vein runs in a straight line past the cross-vein for a distance about equal to the length of that vein, then bends forward in a gentle curve and is almost straight for the rest of its course, but with a slight convexity forward. It ends some distance before the apex, near the third vein. Costa scarcely swollen before the end of the first vein. Fifth vein attenuated near the end, obsolete before the border.

♀. Face white pollinose of about the same width as in the male, ending in a point below, which reaches fully to the lower edge of the eyes. Palpi and proboscis rather small, brownish. First joint of the antennæ shorter than in the male, all the joints blackened along the upper border. Middle tarsi simple; hind metatarsi but little shorter than the following joint. General colour of thorax and abdomen deep blue, verging into green, shining.

Length 4–4·75 mm.; of wing, 4·2 mm.

Eleven males and eight females; one label reads, "Richmond Valley, Forest. 1800 feet, December 31. On stones along stream;" another, "This species lights on rocks in the beds of mountain streams above 1000 feet. Very wary."

The green, blue, and silver colours of this species are so changeable in different lights that they are difficult to describe. There will be no difficulty in recognizing the insect.

Diaphorus.

Meigen, Syst. Beschr., iv., 1824.

1. *Diaphorus opacus*, Loew.

This species was based by Loew on a single male specimen from New York, and a female from Pennsylvania was doubtfully referred to it. The length of these specimens is 3 mm. I have numerous representatives

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of a species from St. Vincent, West Indies, which agree substantially with the description, but are only 2 mm. long; in the males also the hairs on the underside of the middle femora seem to be less conspicuous. It would not be safe to describe the species as new without comparison with the types of *opacus*; for the present I consider it a small form of the latter.

In the West Indian specimens, it is difficult to separate *Diaphorus* from *Chrysotus*. When the face and front are parallel, I have followed the general rule of referring all to *Chrysotus* that did not show in the male sex elongated front pulvilli or large bristles at the end of the abdomen.

2. *Diaphorus approximatus*, n. sp.

♂. Face white pollinose, rectangular, the ground colour blackish; the eyes approximated on the front so as almost to touch, the two frontal triangles and the narrow strip connecting them whitish pollinose. Antennæ short, third joint crescent shaped, with apical arista; second joint with several radiating black hairs of moderate length. Cilia of inferior orbit white. Dorsum of thorax green, dusted with yellow, not very shining; pleuræ black with grey dust. Halteres and tegulæ yellow, the cilia of the latter brown, sometimes a little mixed with white. Abdomen shining dark-green, with black hairs above, which change to reddish on the sides; hair of the venter long, delicate, pale. The four bristles at the apex of the abdomen are small. Hypopygium concealed. Coxæ black; femora brownish-black, yellow at tip; on the outer and lower edge of the fore femora, near the tip is a row of long hairs. Tibiæ yellow, tarsi infuscated from the tip of the first joint, pulvilli of fore tarsi enlarged. Wings slightly brownish, very broad; the greatest width is about the middle; the third vein toward the tip curves noticeably backward. Length 3 mm.; of wing, 2·5 mm.

Numerous males. Sea level to 1000 feet. May. The tegular cilia seem to be pale in some lights and brown in others.

3. *Diaphorus parvulus*, n. sp.

Minute, shining green; legs yellow; cilia of tegulæ and of inferior orbit pale; eyes of male broadly separated.

♂. Face blackish; with grey dust; palpi brownish-yellow,

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front shining green, broader than face; antennæ black, third joint rather large, with subapical arista. Cilia of inferior orbit white. Thorax shining green, a little dusted; bristles black; pleuræ black, with thin grey dust. Abdomen shining bronze-green, venter yellowish; the black bristles at apex not present; hypopygium concealed, the tips of two small, yellow appendages visible; hair of abdomen black, below somewhat reddish. Fore coxæ yellow, with yellow hairs; middle coxæ pale at tip, the basal half or more blackish; hind tibiæ yellow with dark base. Femora, tibiæ and tarsi yellow, the last one or two joints of the tarsi infuscated; the femora sometimes have a brownish tinge. Fore tarsi one and a-half times the length of the tibiæ, with enlarged pulvilli; the other pulvilli of equal size scarcely enlarged. The erect lateral bristle of the middle tibiæ very large. Wings yellowish, with yellow veins and the usual configuration.

♀. Antennæ, particularly the third joint, smaller. Pulvilli plain; otherwise as in the male.

Length 1·2 mm.; of wing, the same.

Three males, three females, 1500–2000 feet. May, July.

4. *Diaphorus dimidiatus*, n. sp.

Light green, whitish pruinose; basal half of abdomen yellow.

♂. Face and front concolorous, bluish-green with grey dust; lower part of the face rather narrow, palpi rather large, pale yellow, with black hairs; antennæ blackish, third joint very short, with dorsal arista; cilia of lateral and inferior orbit pale, the lower ones long. Thorax light green, somewhat bluish, wholly pruinose with white; in the middle of the dorsum a little shining; pleuræ concolorous with the dorsum, opaque; halteres large, pale yellow; tegulæ pale yellow with black cilia. Second and third segments of the abdomen light yellow, with black hairs; fourth and fifth segments shining green, a little coppery; the four apical bristles large; hypopygium concealed, with scarcely visible appendages. Fore coxæ pale yellow, with long black bristles and a few small black hairs on the front side; middle coxæ black with yellow tip, with rather coarse black bristles on the front side; hind coxæ brownish-yellow, more black at base, purer yellow at tip, with a single lateral bristle. Femora, tibiæ and tarsi yellow, the last two or three joints of the tarsi infuscated; the fore tarsi are longer than the tibiæ, with pulvilli as long as the third joint; middle tarsi proportionally a little shorter, their pulvilli

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almost the same size. Middle tibiæ on the outer front edge with two bristles besides the one at the tip; hind tibiæ slender, with a few small bristles behind. Wings rather narrow, subhyaline, with yellow veins. The anterior end of the large cross-vein is in the centre of the wing. Length 2 mm.; of wing, 1·8 mm.

Five males. May. This species belongs to the group of *D. hoffmanseggii*, Meig., of Europe, and *D. satrapa*, Wheeler, of Nebraska, but is readily distinguished by the characters given.

5. *Diaphorus contiguus*, n. sp.

Brownish, opaque species, or sometimes slightly shining; femora black, tibiæ yellow; cilia of inferior orbit and of tegulæ blackish; eyes of male broadly contiguous.

♂. Face opaque, blackish, short; palpi brown; antennæ very short arista sub-apical; ocellar tubercle prominent; cilia of inferior orbit almost black, yet in certain lights rather brownish. Dorsum of thorax opaque-brown, the ground colour being blackish and the thick dust light-brown. Pleuræ black with thinner and greyer dust; halteres and tegulæ yellow, the latter with black cilia. Abdomen opaque-black with black hairs; the apical bristles large; appendages of the hypopygium not or scarcely visible. Coxæ and femora black, the latter with yellowish tips. Front femora along the lower and outer edge with a row of long hairs; middle and hind femora with a few rather long hairs near the tip on the fore side; tibiæ yellow, with only few and weak bristles, except at tip. Fore tarsi once and a half as long as the tibiæ, the pulvilli large; middle tarsi scarcely longer than the tibiæ, the pulvilli small; all the tarsi infuscated from about the third joint. Wings very broad near the base on account of the extraordinary development of the anal angle; first vein farther from the margin than usual.

♀. Face and front of equal width, the face remarkably broad and short, greyish brown; the large palpi of the same colour; front opaque-brown; front femora destitute of long hairs; bristles of posterior tibiæ stronger than in the male; wings, although very broad, not quite so much so as in the male.

Length 2 mm.; of wing, 1·8 mm.

Eleven males, seven females. May.

6. *Diaphorus flavipes*, n. sp.

Pure green, lightly dusted; cilia of tegulæ and inferior orbit pale; legs yellow; eyes of male contiguous.

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♂. Face short, small, greyish pollinose; antennæ small, brownish, second and third joints short but rather large, with almost apical arista. Eyes contiguous for a moderate distance; palpi and proboscis yellow; cilia of inferior orbit white. Thorax green, slightly dusted, the smaller bristles of a rusty reddish colour, the larger ones at the tips the same, but black at base; pleuræ blackish, grey-dusted. Halteres large, pure sulphur yellow, tegulæ brownish-yellow with yellow cilia. Abdomen shining bronze-green, venter yellowish; hairs of abdomen yellow, the apical bristles not present; hypopygium concealed, only some minute yellow appendages visible. Coxæ femora, tibiæ and tarsi yellow, the middle coxæ largely blackish at base and the tips of the tarsi a little brownish; bristles of tibiæ extremely small and weak, except at the tips of the posterior ones. Fore tarsi longer than tibiæ, pulvilli enlarged; pulvilli of middle tarsi scarcely at all enlarged. Wings yellowish, with yellow veins, widest about the middle.

♀. Front as wide as the face below, a little wider above, shining green, with yellow dust below and at the sides; thorax shining green with yellow dust, the larger bristles scarcely reddish at tip; yellow hair of the abdomen rather dense near the tip; bristles of the posterior tibiæ larger than in the male; pulvilli small.

Length 2–2·4 mm.; of wing, 2 mm.

Numerous males and females. March to September. Sea-level to 2000 feet.

7. *Diaphorus dubius*, n. sp.

Greenish-bronze, moderately shining; eyes of male not approximated; femora black, tibia yellow.

♂. Face obscurely dusted with greenish-white, parallel; front green, shining only in a band across the vertex, the remainder yellowish dusted; antennæ black, the third joint very short, subreniform, with apical arista; cilia of inferior orbit pale, palpi and proboscis blackish, the former of ordinary size. Thorax bronze-green, a little shining; the pleuræ blackish, with white dust, more conspicuous posteriorly; halteres and tegulæ yellow, the tegular cilia black. Abdomen bronze-green with a coppery reflection, sometimes scarcely at all green; its hairs are black, on the lower side less so and longer; the four stout black hairs at the apex are well-marked in some specimens, in others not. Hypopygium concealed, its appendages small and inconspicuous. Coxæ and femora ck, trochanters and tips of femora reddish; the fore coxæ with

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black hairs on the front side, middle coxæ with a few coarse blackish hairs in front, hind coxæ with a single lateral bristle; near the end of each femur, on the outer side, are three or four larger hairs; on the anterior side of the middle tibia just below the knee, is a single erect bristle, on the posterior side of the hind tibiæ are two or three small bristles. The pulvilli of the fore tarsi are enlarged; fore and middle tarsi infuscated from the tip of the first joint, the length of the former exceeding that of their tibiæ; hind tarsi shorter than their tibiæ, the infuscation beginning near the base. Wings of only ordinary width, subhyaline, the fourth vein ending exactly in the apex, the outline is more rounded before the apex than behind it.

Length 2·4–2·7 mm.; of wing, the same.

Numerous males and females. 500–1500 feet altitude.

This species differs from *sodalis*, Loew, by its smaller size and black hairs on the fore coxæ. The female of *dubius* differs from the male in having a slightly wider face, smaller antennæ, shorter and thicker abdomen, the femora without longer hairs, and the tibiæ with stronger bristles. In a large series of specimens I notice considerable variation: some of the specimens if alone would no doubt be referred to *Chrysotus*.

Chrysotus.

Meigen, Syst. Beschr., iv., 1824.

1. *Chrysotus excisus*, n. sp.

♂. Eyes broadly contiguous on the face, with an area of enlarged facets; front broad, short, deep bluish-green to bronze-green in colour; palpi and proboscis blackish. Antennæ black, the third joint very large, kidney-shaped, hairy along the outer part; arista apical, arising from a deep notch in the joint. In some specimens this peculiarity is but little developed; in others it is very distinct; in some specimens the point below the notch is longer than the one above, giving the arista a subapical position. Cilia of inferior orbit small, brownish. Dorsum of thorax bright bluish-green, sometimes more bronze or coppery; pleuræ black; tegulæ and halteres yellow to brown, the former with black cilia. Abdomen short, thick, black, scarcely with a green reflection; hypopygium concealed, sometimes with a minute brownish appendage or two barely visible. Feet black; from the knees down

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sometimes more brownish than black, with close black hair. Fore tarsi longer than the tibiæ; the middle and hind femora have near the tip below a few bristles; the latter not ciliated. Wings almost hyaline, rather small in size, of the usual shape.

♀. Face blackish, of ordinary structure; third joint of antennæ not so large nor so deeply notched as in some of the males; halteres yellow.

Length 1·7–2·1 mm.; of wing, the same.

Numerous males and females. 500–2000 feet altitude.

2. *Chrysotus proximus*, n. sp.

Differs from the preceding species only in having the legs from the knees down light yellow; some of the males have the third joint even larger; the average size is smaller. In some specimens the trochanters also are yellow. Length 1·6–2 mm.; of wing, the same.

Numerous specimens, as above.

3. *Chrysotus flavus*, n. sp.

Wholly pure yellow species; eyes of male contiguous on the face.

♂. Palpi large, about half as long as the face, yellow; eye contiguous, leaving a blackish triangle below the antennæ; front very broad at vertex, narrow towards the antennæ, dark in colour, probably metallic in living specimens; antennæ rather large, the third joint a little elongated with a subapical brownish arista; the colour of the antennæ is wholly yellow; cilia of lateral and inferior orbit yellow. Thorax with pleuræ wholly yellow, the bristles blackish, but in a strong light more yellowish. Cilia of tegulæ brown; below the tegula a small blackish spot. Metanotum strongly developed. Abdomen yellow, the dorsum blackish except at base; the first segment has a row of long hairs, black above, at the sides yellow. The hair of the dorsum is blackish, of the rest yellow. The abdomen as a whole is short, the hypopygium concealed, a few minute yellow organs visible. Legs from coxa to tarsus wholly pure yellow, with yellow hairs and bristles; middle and hind tibiæ rather bristly, the hind tarsi with small bristles below. Wings almost hyaline; fourth vein perfectly straight in its last segment, ending behind the apex.

♀. Face very narrow, white pollinose; palpi long, broader than in the male, resting on the very large yellow proboscis.

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Abdomen only a little blackish above, but still with black hairs.

Length 1·6 mm.; of wing, 1·6 mm.

One male, one female. 1000 feet.

4. *Chrysotus albipalpus*, n. sp.

Minute blackish species, the male with contiguous eyes and large white palpi.

♂. Eyes briefly contiguous or just touching on the face, with some very large facets at this point; the palpi are large, snow-white; the front, and also the facial triangle below the eyes yellow-dusted on a green colour. Antennæ small, black, the third joint not enlarged, rounded, with apical arista. Cilia of inferior orbit white and rather long. Dorsum of thorax green, somewhat golden, moderately shining; a dark stripe along the lateral edge. Pleuræ black with white dust; tegulæ somewhat infuscated, with black cilia; halteres yellow. Abdomen dark green, scarcely shining, short, somewhat clubbed toward the apex. Hypopygium concealed, some small dark processes slightly visible, more remote than usual from the apex of abdomen. Coxæ and femora black, the former with pale hairs; tibiæ varying from yellow to brown; bases of tarsi concolorous with tibiæ, tips darker. Pulvilli of fore tarsi considerably, of the middle tarsi less, enlarged. Wings tinged with brown, considerably rounded behind, fourth vein ending in the apex.

♀. Face of moderate width, white pollinose, tibiæ usually light-yellow. Otherwise substantially as in the male.

Length 1·5; of wing, 1·3 mm.

Numerous specimens. May, June. 500–1500 feet.

The variability of this species is somewhat puzzling; in some specimens the abdomen is deep violet, in others the halteres are yellowish-white.

5. *Chrysotus niger*, n. sp.

Palpi brownish; eyes not quite contiguous; face and front opaque black, the latter a little greenish. Dorsum of thorax black, scarcely greenish. Pleuræ, abdomen, coxæ, and femora black, the coxæ with brown hairs. Halteres black, the stem brown; tibiæ and tarsi blackish, sometimes more brownish, in the female yellowish-brown and the femora brown. Otherwise as the preceding species. Length 1·3 mm.

Seven males, six females.

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6. *Chrysotus hirsutus*, n. sp.

♂. Palpi prominent, pale yellow; eyes contiguous on the face, leaving a whitish-dusted triangle below the antennæ; front shining green; antennæ small, black, with apical arista; cilia of lateral and inferior orbits white. Dorsum of thorax bright green; pleuræ blackish, with dense whitish dust; cilia of tegulæ brownish-yellow; tegulæ and halteres yellow. Abdomen shining green at the base, more blackish posteriorly, with black hairs; hypopygium concealed, only a small appendage or two, with rather long yellow hairs visible. Fore coxæ yellow, dark at base, with a group of brown bristles near the tip; middle and hind coxæ blackish, with yellow tip. Fore femora, tibiæ, and four joints of tarsi yellow, the last tarsal joint blackened, with enlarged pulvilli; the fore femora are a little thickened, and on the underside have a row of brownish hairs; the tibiæ on the underside have a row of long, closely-appressed hairs. The middle femora have a row of hairs, like the front ones; their tarsi are blackened from the tip of the first joint, and the pulvilli are small. The hind femora are thickened, the apical third infuscated. The row of hairs below ends near the tip, with four or five coarse bristles; knees yellow; hind tibiæ yellow with a brown stripe down the whole length of the outer side, upon which is situated a dense row of bushy brown hairs; these hairs continue down the tarsus, becoming smaller beyond the first joint; the tarsi are very short and tapering, the first joint about two-thirds as long as all the rest; they are gradually infuscated beyond the first joint. Wings hyaline; fourth vein a little bent just beyond the posterior cross-vein, ending in the apex; the curve before the apex is but little fuller than that behind it.

♀. Face rather broad, white pollinose; fore coxæ with rather numerous yellowish hairs; femora not perceptibly thickened, these and the tibiæ without rows of hairs; hind femora with two or three pre-apical bristles, only its tip infuscated. The hind tibiæ have several stout bristles, and the metatarsus is scarcely half as long as the following joints, all of which are plain.

Length 1·6 mm.; of wing, 1·4 mm.

Numerous males and females. March, May. Sea-level to 1000 feet.

This species will probably form a new genus. I place it here provisionally, on account of the male eyes.

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7. *Chrysotus longipalpus*, n. sp.

♂. Palpi pale yellow, toward the tip whiter, almost as long as the head is high, proportionately rather narrow; face slender in the middle, where the eyes almost touch, light dusted on the triangle below the antennæ; front deep violet, not very shining; antennæ yellow or brownish-yellow, last joint hairy, with subapical arista; cilia of inferior orbit pale. Dorsum of thorax green, moderately shining. Pleuræ black, with delicate pale dust. Cilia of tegulæ blackish or brownish; halteres yellow. Abdomen bluish-black, somewhat shining, with black hairs; hypopygium concealed. Coxæ yellow, the middle ones dark at base; femora and tibiæ yellow, in some ill-preserved specimens the hind ones a little brownish; the first joint of the fore tarsi is about as long as all the rest; the second, third, and fourth joints are slightly compressed, from the tip of the first joint all are infuscated. Hind femora with about three pre-apical bristles in a row, the tibiæ rather hairy, and the tarsi infuscated from the tip of the second joint. Wings hyaline, of the ordinary type, fourth vein ending in the apex.

♀. Palpi normal, face violet, like the front; only the fourth and fifth joints of the tarsi, with extreme tips of the preceding, are infuscated.

Length 1 mm.; of wing, 1 mm.

Nine males, three females. May. 500–1500 feet.

8. *Chrysotus picticornis.*

Loew, Monogr., ii., 184; Wheeler, Psyche, June, 1890, p. 358.

Numerous specimens; both sexes. May. Sea-level to 500 feet.

9. *Chrysotus acutus*, n. sp.

♂. Eyes contiguous for a considerable distance on the face; palpi dark; front opaque black; antennæ black, rather large, the third joint large, with dense brown hair, drawn out in an acute point, before the tip of which the arista is inserted. Thorax green, moderately shining, sometimes considerably dulled and more brownish; pleuræ black. Halteres and tegulæ, with the tegular cilia, black. Abdomen black; hypopygium concealed. Coxæ brown, the anterior ones with blackish hairs; femora brown, varying somewhat in depth of colour the hind ones with a row of four

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or five small pre-apical bristles; tibiæ yellow, the hind ones a little darker; tarsi yellow, fourth and fifth joints of the fore ones black, the posterior ones gradually infuscated from the tip of the first joint. On the front side of the fore tibia is a row of small but distinct white hairs. Wings somewhat infuscated, of the usual shape, fourth vein ending very slightly before the exact apex. Length 1·1 mm.; of wing, 1 mm.

Seven males. 500–1000 feet.

10. *Chrysotus inermis*, n. sp.

♂. Face of moderate width, parallel, blackish-green, but little dusted; palpi dark; front shining green, slightly dusted; cilia of inferior orbit brownish-yellow; antennæ black, the third joint short, a little hairy, with apical arista. Dorsum of thorax shining green, thinly covered with yellow dust; pleuræ black, yellowish dusted; cilia of tegulæ brown, halteres yellow. Abdomen rather dull coppery colour, verging into blackish, the hairs brownish; hypopygium concealed. Coxæ yellow, the middle ones black nearly to the tip, the fore and middle ones with yellow hairs; femora and tibiæ yellow; the middle tibiæ with an erect bristle below the knee, the hind ones with two or three small bristles behind, otherwise the tibiæ are free from bristles except at apex; tarsi yellow, only a little infuscated at the extreme tip; fore pulvilli large, middle ones only a little larger than the hind ones. Wings yellowish, the fourth vein ending in the apex, posterior cross-vein short, located before the middle.

♀. Face green, white-dusted; proboscis, cilia of inferior orbit and those of the tegulæ paler than in the male; venter slightly yellowish at base.

Length 1·6–2 mm.; of wing, 1·5–1·8 mm.

Seven males, numerous females. May and July. 500–2000 feet altitude.

The females of this species so closely resemble those of *Diaphorus flavipes*, that they can scarcely be separated, I could find no distinct differences.

11. *Chrysotus apicalis*, n. sp.

♂. Front shining green, wide; face of same colour with a little pollen, narrowed in the middle, owing to an area of enlarged facets in the eye; eyes somewhat emarginate at the level of the antennæ; palpi yellow; antennæ black, the first joint bare, this and the second of ordinary structure; the third joint crescent

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shaped, in its vertical diameter very large, on the apical side near the middle suddenly drawn out into a long, narrow point; arista inserted just before, or in some cases almost exactly at, the apex of the prolongation, moderately long, pubescent; the whole inner and lower surface of the third joint is light pilose. Cilia of the inferior orbit white, a considerable amount of long white hair behind them. Thorax golden-green on the middle, more or less covered with pollen, around the margins more pollinose; acrostichal bristles few, in two rows; the small humeral bristles number only about half-a-dozen on a side; about the base of each large bristle is a black dot. Pleuræ greenish-black, dusted with white. Tegulæ and halteres light yellow, cilia of the former whitish. Abdomen dark green, more or less thickly dusted, sometimes with a bronze reflection. Seen from above, the first segment is very broad with parallel sides; the rest are successively narrower, rapidly tapering. The green colour ends with the fifth segment, the following one is black. From the side, the abdomen is slender the dorsum and venter nearly parallel to the fifth segment. The following two are somewhat excavated on the under side, but only the tips of one or two small organs are visible. Coxæ black, about the apex sometimes slightly yellowish. The front and middle ones with a few black hairs and bristles on the front side; hind ones with one lateral bristle. Front and middle femora yellow, with more or less of a blackish tinge along the upper side. The middle ones are lighter-coloured than the front ones. Hind femora wholly greenish-black. All the tibiæ-yellow, tarsi-yellow, gradually infuscated from the tip of the first joint. Pulvilli of ordinary size. In one single specimen out of fifty examined there is, on the middle of the lower surface of one of the hind metatarsi, a slender erect bristle. This is probably abnormal. Venation normal, the same as figured by Loew for *C. obliquus* (Mon., N.A. Dol., Pl. VI., 31).

♀. Face rather wide, not narrowed in the middle; this and the front often with a steel-blue reflection, somewhat dusted with white or yellowish. Below the middle of the face the contour is interrupted by a suture, except in the middle; below this the face is more prominent. The oral cavity and the proboscis are much larger than in the male. Palpi large, flat, yellow, sometimes brownish, with white or yellow pollen. Proboscis projecting below the head, black. Antennæ as in the male, but the third joint not at all drawn out, simply crescent-shaped, at most a little triangular. Arista apparently apical. Behind the orbital cilia but a few hairs. Colour of thorax and abdomen more opaque than

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in the male. Fore and middle femora yellow, hind ones slightly yellow at base and tip.

Length 2 mm.; of wing, 1·8 mm.

Numerous specimens. Sea level to 1000 feet. May.

Asyndetus.

Loew, Centur., viii., 58, 1869.

1. *Asyndetus fratellus*, n. sp. (Pl. XII., fig. 114, tip of wing.)

♂. Green, thickly dusted, not shining except on femora and slightly on abdomen. Face very broad, the sides parallel, covered with opaque, whitish dust. Palpi rather large, with black hairs and whitish-dusted. Front very broad, like the face in colour but a very little less dusted, showing more of the underlying green. Antennæ black, short, the second and third joint together nearly circular in outline. Arista dorsal. Orbital cilia black above, white below. Thorax heavily dusted with brownish, not at all shining, a single scattering row of very minute acrostichal bristles. On each side of the broad, median dorsal stripe is an ill-defined, light-blue dusted stripe, so that the brown colour appears to form three broad longitudinal bands, the lateral ones so wide as to extend down over the pleuræ for some distance, the blue colour reaches the corners of the scutellum, and the latter is wholly blue, except a narrow trace of brown along the posterior border. It has two large bristles. Pleuræ brownish above, fading into light blue below. Tegulæ yellow, their cilia whitish. Halteres yellow. Abdomen moderately elongate, tapering, green, but little shining. Behind each incisure the colour is deep blue and more metallic. The hair of the abdomen is black, and conspicuously coarse and long. Hypopygium small, embedded, with four bristles pointing backward. These are about as long as the fifth segment. Legs robust, black, bristly, the coxæ whitish from the overlying dust, front and middle ones with numerous bristles on the front side, the hind one with a single lateral bristle. Femora all somewhat thickened, dark green rather shining, with rows of moderate bristles on the under side. These structures are not raptorial, since they are rather weak and the tibiæ lack the corresponding development. Knees narrowly yellow. Tibiæ fuscous, the front ones a very little lighter, simple, with strong bristles. Tarsi black, simple. Pulvilli of all the feet much elongated, yellow. Wings slightly greyish, fading into hyaline posteriorly and

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Explanation of Plate XII.

Fig. 108. *Leptorhethum angustatum*, ♂ wing.
109. *Gnamptopsilopus flavidus*, wing.
110. *Eutarsus sinuatus*, ♂ wing.
111. *Hercostomus latipes*, tip of wing.
112. *Leptocorypha pavo*, wing.
113. *Polymedon superbus*, wing.
114. *Asyndetus fratellus*, tip of wing.
115. *Eutarsus sinuatus*, ♀ wing.
116. *Pœcilobothrus unguiculatus*, tip of wing.
117. *Lyroneurus simplex*, ♂ wing.
118. *Polymedon superbus*, ♀ head.
119. „ „ ♂ head.
120. *Ophyra æneseens*, ♂ head, 120*a* wing.
120*bis*. *Sarcophilodes puella*, ♂ head.
121. *Cyrtoneura maculipennis*, ♂ head, 121*a* wing.
122. *Limnophora exul*, ♂ head, 122*a* wing.
123. *Cœnosia insularis*, ♂ head, 123*a* wing.
124. *Tanypeza claripennis*, ♂ head, 124*a* wing.
125. *Calobata mellea*, wing.
126. *Nerius bistriatus*, ♀ head, 126*a* wing.
127. *Euxesta stigmatias*, wing.
128. „ *apicalis*, wing.
129. *Trypeta* (*Tephritis*) *fucata*, wing.

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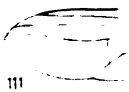
108

109

110


111

112

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118

119

120 *bis.*

120 *a*

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121 *a*

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122 *a*

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123 *a*

124 *a*

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125

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126 *a*

127

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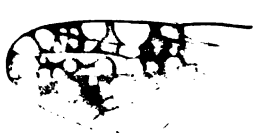

Edwin Wilson del.

WEST INDIAN DIPTERA.

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apically. The first longitudinal vein ends about one-third of the way to the apex. Its end is a trifle beyond the large cross-vein. Second and third veins close together diverging uniformly through their whole course, the latter ending rather far from the apex. The costal vein ends with the third longitudinal instead of continuing to the fourth. The fourth longitudinal vein becomes gradually weaker beyond the posterior cross-vein for about three-fifths of its course. It then curves suddenly forward for a short distance, curves back again into its original direction, and ends in the apex. The whole portion beyond the first curve is very delicate and transparent, and sometimes the section running forward is entirely obsolete.

♀. Face scarcely wider than the male. Pulvilli of usual size. Abdomen even less metallic than in the male, without the terminal bristles, otherwise appearing much the same. The tibiæ and tarsi are sometimes lighter in colour than in the other sex.

Length 2·3 to 2·5 mm.; of wing, 2 mm.

Eleven males and twenty females. Several specimens are labelled "May," and one "Seashore."

This species is closely allied to *A. interruptus*, Loew, but the latter is over 5 mm. long. The colour of the thorax seems by the description to be different also.

Lyroneurus.

Loew, Wien. Ent. Monatsch., i., 37, 1857.

1. *Lyroneurus simplex*, n. sp. (Pl. XII., fig. 117, wing ♂.)

♂. Front bright bluish-green, brownish-black along the borders; face green, brownish dusted, but somewhat silvery pollinose from above, a very little narrowed in the middle. Palpi yellow, with long black bristles, proboscis black. Antennæ black, very short, the third joint crescent-shaped, hairy, with a long slender subapical arista. Cilia of the inferior orbit and another row behind them white. Thorax metallic-green brown-dusted. Acrostichal bristles in a single row. Eight or ten small humeral bristles. A brownish-black stripe along the transverse suture, running forward to the humerus. Just below, a spot is silvery when viewed from above. Pleuræ green, white pollinose, more silvery from above. Halteres and tegulæ yellow; cilia of the latter yellowish. Scutellum with the usual small and large bristles; between the scutellum and wing is a concave area, black, with a silvery spot. Abdomen green, considerably dusted, rather elongated, scarcely tapering. Hypopygium concealed, only a few minute yellow

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and black parts visible. A few moderately long bristles at the end of sixth, as of the other segments. Front coxæ green at base, changing through brown to yellow at the tip, considerably white pollinose. A row of black bristles at the tip, and a few fine yellowish hairs on the front side. Middle and hind coxæ blackish, the former has a number of stout bristles on the fore side, one near the base is more lateral and quite prominent. Hind coxæ with a single lateral bristle. Trochanters all yellow. Femora all dark-green, somewhat shining; the front and middle ones broadly, the hind ones slightly, yellow at the knee. Tibiæ all yellow, the hind ones a little infuscated at the tip. Front and middle tarsi elongated, slender, yellow, infuscated from the tip of first joint; hind ones shorter and thicker, wholly infuscated. First joint longer than the following one, on its under surface with a long slender upright bristle. Front pulvilli a little enlarged. Wings large, wide toward the apex, yellow before the third vein. The first and second veins are rather far from the costa, and enter it at a less acute angle than usual. The third vein runs close to the second to its end, then turns with a strong curve backward, reaching the margin just before the apex. The last section of the fourth vein in the shape of a gentle double curve, ending just behind the apex.

♀. Front as in the male. Face rather wide, the suture distinct, less pollinose than in the male. Hind metatarsus without the bristle. Wings of the ordinary width, not yellow before the third vein; venation exactly like that of *Eutarsus aulicus*, Meig., in Loew's Monograph, pl. vi., 28 *c*.

Length 3·5–5·5 mm.; of wing, 3–4·3 mm.

Numerous specimens of both sexes. Sea level to 1500 feet. March and May. One specimen labelled "Forest by stream."

The venation of the male varies from that described to a form like that of the female.

Eutarsus.

Loew, Neue Beitr., v., 1857.

1. *Eutarsus sinuatus*, n. sp. (Pl. XI., fig. 104, wing. Pl. XII., fig. 110, ♂ wing; fig. 115, ♀ wing.)

♂. Face exceedingly narrow, almost linear; silvery pollinose on a dark ground colour. Palpi small, yellow. Front narrow, of same colour as face. Antennæ situated high up, the front therefore short and the face long. They are very short, the third joint

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especially small, all yellow but the tip of third joint. Arista subapical, brown, the basal joint somewhat incrassated. Cilia of inferior orbit delicate, of a whitish colour. Dorsum of thorax yellow in front, the posterior part and scutellum shining light-green. Acrostichal bristles two-rowed. The green colour extends forward about to the transverse suture. Farther than this it extends only in three fading and irregular streaks. Laterally it does not reach the bases of the wings. Pleuræ plain yellow; a dark spot below and one behind the wing. Cilia of tegulæ yellowish. Metanotum yellow. Abdomen blackish, not shining, more brownish at the base, scarcely tapering. Hypopygium almost wholly concealed, the length of a few scattered yellowish bristles along the venter is noticeable. In some specimens not fully coloured the abdomen is more yellow at base. All the coxæ, legs, and feet light-yellow. Tarsi scarcely at all infuscated. Front ones very long and the pulvilli much enlarged and elongated. Hind metatarsus shorter than the following joint, with a minute bristle below. Front coxæ with fine yellow and black hair and black bristles. Middle coxæ with numerous bristles as in the preceding species. Hind coxæ with one lateral bristle. Wings yellow before the third vein. Venation as figured. The second vein is normal for half its course, then runs farther from the costa, makes a wide sweep, and joins the costa nearly at a right angle. The third vein a little wavy before the end of the second, beyond that bent strongly backward. Fourth vein normal, its last section straight.

♀. The face moderately narrow, excavated, black with white pollen. Front somewhat wider, black with less pollen. Palpi almost concealed, brown. Antennæ scarcely infuscated at the tip, the arista yellowish. Thorax as in the males. Abdomen yellow, the posterior margin of each segment shining black. On the second segment an anterior black crossband, narrow, enlarged in the middle; third segment with a wider band, more enlarged; fourth segment chiefly black; fifth with only an indistinct band of yellow. Legs and feet as in the male, except that the pulvilli of the front feet are of the normal size. Wings but slightly yellow. Veins straight and almost uniformly divergent; only in the second there is an almost imperceptible trace of two sinuations, at the places where these occur in the male. This vein ends nearer the apex than in the male.

Length 2·3–2·6 mm.; of wing, 3·2 mm.

Numerous males and eight females. 500 to 1500 feet altitude.

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Sympycnus.

Loew, Neue Beitr., v., 1857.

1. *Sympycnus falco*, n. sp.

♂. Face blackish, the eyes nearly or quite contiguous about the middle; front blackish; antennæ black, third joint short, pointed, with a subapical arista. Cilia of inferior orbit pale. Dorsum of thorax green, but little shining; pleuræ black with greenish-grey dust; halteres yellow; cilia of tegulæ black, still rather brown at tips, and the lower two or three hairs yellow. Abdomen dull green, with blackish hairs; on each side of the first segment is a row of half-a-dozen long brownish hairs; the hypopygium projects in a sort of rounded knob behind the abdomen, its short, stout, brown grasping organs mostly concealed, and lying in front of the organ proper. Coxæ varying from yellow to brown in different specimens, the middle ones darker than the others, the front ones with yellow hairs and a few slender brownish bristles; femora, tibiæ and tarsi yellow; the fore femora have a short row of brown bristles on the hind side near the tip, the fore tibiæ on the front side with only delicate irregular hairs, in part rather long; the fore tarsi are longer than the tibiæ, the last joint rather long with a projection on the under side near the base; the inner claw folds back to meet this, thus forming a clasping organ; all the tarsi are only gradually infuscated near the tip. Wings slightly yellow, slender, the posterior cross-vein before the middle; from the cross-vein, the second and fourth veins are parallel, while the third converges toward the fourth in the latter part of its course.

♀. Face moderately narrow, black, with white pollen; fore femora and tarsi plain; venter brownish near the base; lateral bristles of first abdominal segment shorter.

Length 1·6–2 mm.; of wing, the same.

Four males, six females. 1000–3000 feet altitude.

2. *Sympycnus similis*, n. sp.

♂. Differs from the foregoing species chiefly in having on the front side of the fore tibiæ a row of four very stiff, stubby bristles of moderate length. The coxæ and wings are also a little darker, and the hypopygium projects a little more behind. Length 1·6 mm.; of wing, 1·7 mm.

One male. 1000 feet altitude.

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Neurigona.

Rondani, Prod. Dipt. Ital., 142, 1856.

1. *Neurigona signifera*, n. sp.

♂. Face very narrow. Immediately under the antennæ is a triangular portion, yellow. Below this there is only a narrow groove between the eyes to below the middle, from this point the face protrudes as a narrow, whitish wedge, slightly wider at the bottom. Palpi yellow. Proboscis brownish. Front greenish-brown, a little dusted, converging below. Antennæ yellow, third joint with a short point, arista yellow. Inferior orbital cilia whitish. Occiput green with white dust. Thorax dark yellow, glabrous, with black bristles. Acrostichal bristles small, in two rows. On each side of the acrostichal bristles in front an area of small bristles, bounded by the humeri and the anterior margin. The characteristic flat bare disk of the back part of the dorsum is of a beautiful greenish-blue colour, which extends to the disk of the scutellum. Sides and border of the scutellum yellow. Two very large bristles between two very minute ones on the border. A very large bristle behind the root of the wing. Pleuræ deep-yellow, imperceptibly dusted, a dark spot above the middle coxa. Tegula, cilia whitish. Abdomen slender, yellow, the segments beyond the second successively shorter. The second segment bears near its anterior margin an opaque black band, emarginate behind in the middle and rounded at each end It is about half as wide as the segment. The following segments have similar bands, less emarginate and occupying more of the width of the segment, to the fifth, which is wholly black across the dorsum; like the others it is yellow along the ventral side. Hypopygium shining black, turned under, club-shaped, not much exserted, the appendages not distinct. All the coxæ yellow; front ones long, with black hairs and mixed brownish and yellowish bristles; middle ones with black hairs; hind ones with a single bristle on the outer side. Legs yellow, simple, the bristles small. Tarsi a little infuscated toward the tip. Wings a little yellowish, fourth vein in its last segment only very gently curved, almost perfectly parallel with the third.

♀. Face narrow, strongly protruding below, yellow, and yellow pollinose. Palpi larger than in the male. Third joint of antennæ small, exceedingly short, almost kidney-shaped.

Length 3·5 mm.; of wing, 3·4 mm.

Seashore to 1500 feet altitude. Two males and two females.

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Cœloglutus,* n. g.

♀. First joint of antennæ bare, the second short, with a prolongation along the inner side of the third; the latter somewhat crescent or kidney-shaped, with a subdorsal arista. Face narrow, more so a little below the antennæ. Ocellar tubercle distinct, the ocellar and lateral bristles strong. Thorax elongated, the wings attached far behind the middle. Acrostichal bristles in two rows. Small humeral bristles covering an area of half the length and almost all the width of the dorsum, comparatively large. A large concave surface begins at the middle of the dorsum and extends to the scutellum including half the width. Scutellum with only two bristles. Latero-dorsal thoracic bristles large. Fore and middle coxæ with considerable hair on the front side, hind coxa with a single lateral bristle. Hind metatarsus half the length of the following joint. Wings hyaline the apex a little pointed. After the anterior cross-vein, the fourth vein runs somewhat backward, diverging but little from the fifth, to the posterior cross-vein; thence it runs in a direct line toward a point a little before the apex, near the margin it curves gently backward again, and ends in the apex. Posterior cross-vein short, four times its length from the margin. Sixth vein perceptible.

1. *Cœloglutus concavus*, n. sp. (Pl. XI., fig. 105, wing.)

♀. Face white-pollinose, front more thinly so, showing a little green. Antennæ yellow, except the third joint which is brownish, the inner side of the second is as long as the first joint, the ocellar bristles are long, and curve back more abruptly than usual. Cilia of inferior orbit white. Proboscis rather prominent, brown, the palpi yellow. Dorsum of thorax violet-green, the concavity more pure green. Pleuræ likewise violet-green, whitish-dusted. Halteres, tegulæ and tegular cilia yellow. Above the root of the fore coxa are two white bristles. Abdomen rather broad and flattened, blackish-green with black hairs and, especially on the sides, some white ones; the ovipositor is black. Fore coxæ yellow, elongated, with a groove on the outer side; the fore side has numerous black hairs but no bristles. Middle and hind coxæ close against each other, rather distant from the front ones; the middle ones are blackish with yellow tip, hairy in front; the hind ones yellow a little darker at base, with a whitish lateral bristle. Femora and tibiæ yellow, the extreme tips of middle and hind tibiæ blackish. Tarsi infuscated from the tip of first joint, the front ones less so. Wings a little greyish, with yellow veins as figured. Length 2·2 mm.; of wing, 2·1 mm.

A single female.

* κοῖλος, concave; γλουτός, rump.

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Achalcus.

Loew, Neue Beitr., v., 1857.

1. *Achalcus sordidus*, n. sp. (Pl. XI., figs. 107, wing of ♂; 107*a*, wing of ♀.)

Minute, blackish, non-metallic, the male with an opaque brown or yellow spot in the first posterior cell.

♂. Face narrow, more so in the middle, where the eyes are almost contiguous. Antennæ short, third joint a little pointed, with an apical, or perhaps subapical, arista. Front wide. Thorax and abdomen blackish, non-metallic. Hypopygium concealed, but rather large, hence the abdomen scarcely tapering. Legs dull brown or yellowish, variable according to the age of specimen when captured. Wings slightly brownish, slender; sixth vein wanting, first very short, ending but little beyond the fork of the second and third; third ending a little before the apex; fourth sinuous, as figured, along its front side, near the end, a large yellow or brown opaque spot. The hind margin sinuous, and fringed with delicate hair. Acrostichal bristles in two rows.

♀. Face wider, not narrowed; antennæ a little shorter, venation simple.

Length 0·7 mm.

Two males and four females. Altitude 500–1000 feet. The specimens are so badly shrivelled that a complete description is impossible. The size, colour, and especially the venation, are sufficient to distinguish the species.

Xanthotricha, n. g.*

Small species, with yellow or brownish bristles and hair; legs yellow; face in male rather narrow; antennæ small, the first and second joints united to form a sort of cup, in which the third is inserted, like an acorn; first antennal joint bare above; arista apical or subapical; hypopygium exserted, small or large; dorsum of thorax convex behind; hind metatarsus short; acrostichal bristles two-rowed. First longitudinal vein very short, sixth wanting; fourth vein straight beyond cross-vein.

1. *Xanthotricha cupulifera*, n. sp. (Pl. XI., figs. 106, wing; 106*a*, hypopygium.)

Metallic-green, legs and all the bristles yellow.

♂. Face narrow, wider above, in a certain reflection violet, without dust; front wide, rather short, violet, proboscis and palpi

* Ξανθός, yellow; τρίχος, hair.

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yellow; antennæ pure yellow, with long brownish arista; cilia of inferior orbit yellow. Thorax shining green, somewhat bluish, decidedly globose above on the anterior part. Scutellum short and wide, crescent-shaped, with one pair of bristles (the outer pair are microscopic). Pleuræ black, the posterior margin, tegulæ, and halteres light yellow; cilia of tegulæ yellow. Abdomen shining bluish green, the venter yellow, sixth segment wholly yellow. First joint of hypopygium yellow, small, lying along the basal and dorsal (outer) surface of the second; the latter brown, elongated, tapering, at its apex with a pair of minute, delicate yellow lamellæ, fringed with light yellow hairs. The interior organs, arising from the basal portion, are three in number—a long, straight, sharp, yellow central one (penis ?), and two slender bare yellow filaments; the former is about as long as the hypopygium itself, the latter are much longer, somewhat crooked in the described specimen. Coxæ and all the legs pure light yellow, almost destitute of bristles. Wings hyaline, the veins yellow.

♀. Somewhat smaller, otherwise not materially different.

Length 1·2–1·5 mm.

One male, numerous females. May, March. Two other males, more shrivelled and discoloured, are considerably darker than the perfect specimen here described.

2. *Xanthotricha minor*, n. sp.

Resembles the preceding, except in the following respects: The general colour is somewhat darker, the venter and sixth segment not yellow, male hypopygium blackish, the delicate parts shrunken and difficult to make out, but apparently without the long filaments so characteristic of the preceding; pleuræ wholly bluish black; the posterior cross-vein is shorter, in consequence of the fact that the fourth vein bends back to meet it, forming a distinct angle at this point. The last character is sufficient to separate the two species. Length 1·2 mm.

One male, two females. 500 feet.

3. *Xanthotricha singularis*, n. sp.

Still a third species of this minute genus differs from the first in its extremely small size, in its colour, which is in general the same as the second, and in the singular structure of the male hypopygium. This bears a close resemblance to the ovipositor of a female, extended to its full length and bent under the abdomen. Only by using a power of several hundred diameters could I

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ascertain that this structure really belonged to a male instead of a female. The females of the species, however, do not have such extended ovipositors; so the resemblance is rather to what one might suppose the female to be than to the female itself. This hypopygium is black, minutely yellow at tip. The wings of this species resemble those of the first, but are a little more rounded. Length 1 mm.

Six males, three females. May. 500 feet.

GNAMPTOPSILOPUS.

Aldrich, Kans. Univ. Quart., 1893.

1. *Gnamptopsilopus bicolor.*

Loew, Neue Beitr., viii., 96; Monogr., ii., 280 (*Psilopus*).

A single female. May.

Gnamptopsilopus flavidus, n. sp. (Pl. XII., fig. 109, wing.)

Slender, yellow, a broad stripe on the thorax, all the scutellum, and the hind margins of the abdominal segments bright-green. Cilia of tegulæ yellow.

♂. Face bright-green with thin white dust. Palpi and proboscis yellow. Front bright-green. Antennæ yellow, very small, arista dorsal. Thorax yellow, the scutellum violet, a green stripe upon the dorsum of the thorax is as wide as the scutellum behind and tapers in front to a rounded point at the margin. Metanotum yellow. Scutellum with only one pair of large bristles, the outer pair being very small. Abdomen yellow, the first segment above with a very narrow green border behind; the following three segments almost half green; the fifth a little more than half, and the sixth entirely, green. Venter wholly yellow; near the hind margin of each segment are placed several large bristles. Hypopygium embedded, yellow; only two small yellow, hairy, palpus-like organs are visible. Feet wholly yellow, the tarsi only moderately infuscated. Fore coxæ on the front side with a single longitudinal row of minute black hairs, and about three bristles at the end. Front femora near the base with six short thorn-like bristles. Front tarsi nearly three times the length of the tibiæ. Middle tibiæ and metatarsi with two rows of close short cilia, one on the front and one on the upper side; as these cilia project in nearly the same direction, the effect is like a single somewhat tangled row. Hind tarsi as long as the tibiæ. All the legs are

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destitute of large bristles. Wings slender, hyaline. Costa noticeably ciliated along the middle, in the neighbourhood of the first vein. Third vein at its tip recurved forward. Posterior cross-vein oblique, less than half its length from the border. Fork of fourth vein making scarcely a right angle at its origin.

♀. Thorns of the fore femora larger. Middle tibiæ and tarsi simple. Abdomen, except the first segment, with more green on the dorsum, and shorter than in the male.

Length 4·5 mm.; of wing, the same.

Sea level to 500 feet. Six males and eight females.

3. *Gnamptopsilopus flavicornis*, n. sp.

♀. Small, bright green, base of abdomen yellow, antennæ, yellow, the third joint sometimes brownish, arista dorsal or subdorsal. Face moderately narrow for the genus, blue or green, white-dusted. Front shining green, excavated, dusted below. Antennæ yellow, the third joint sometimes brownish; the arista dorsal or subdorsal. Thorax bright green. Scutellum with two large bristles, the outer pair minute, oppressed, or absent. Pleuræ green, white pollinose, the posterior border yellow. Tegulæ and halteres yellow. Abdomen green, the venter dorsum of first and proximal half of second segment yellow. Still in some cases the posterior margin of the first segment green. On the lateral angle of the first segment one or two long black bristles. Remainder of abdomen with small sparse black hair. Legs including coxæ, yellow, the tarsi slightly infuscated. Fore coxæ with three yellow bristles, hind with one. Fore metatarsus scarcely shorter than tibia, middle one but little shorter, whole hind tarsus four-fifths the length of its tibia. The legs have no bristles of any size; at the tips of the middle and hind tibiæ, and on the fore side of the same near the base are very small ones. Wings hyaline, the veins yellow; third vein recurved at tip, branch of fourth vein making a right angle at its origin. Posterior cross-vein oblique, two-thirds its length from the margin. Length 1·8 mm.; of wing, 2 mm.

Three females. One specimen has the third joint of the antennæ brownish-black, and the outer pair of scutellar bristles visible though minute, the other two have the antennæ wholly yellow, and no second pair of bristles whatever. This does not seem to indicate a specific difference.

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PSILOPUS.

Meigen, Syst. Beschr., vi., 1824.

1. *Psilopus chrysoprasius.*

Walker, List, &c., iii., 646; Loew, Neue Beit., viii., 90; Monogr., ii., 266.

Numerous specimens. Sea level to 500 feet. May.

2. *Psilopus caudatulus.*

Loew, Neue Beitr., viii., 93; Monogr., ii., 271.

Four males, two females. May.

3. *Psilopus bellulus*, n. sp.

Shining dark green, cilia of tegulæ black; wings with a dark spot along the apical part of the front side.

♂. Face bright-green slightly white-dusted, with a deep transverse impression below the middle, bare. Palpi black; proboscis brown. Front shining green with sparse and very delicate white hairs, especially towards the sides. Antennæ black; small, the arista dorsal not long. Thorax shining green with erect and rather long bristles. Scutellum with four bristles. Pleuræ green, white-dusted. Tegulæ and their cilia black; halteres fuscous with a yellow knob. Abdomen shining green, somewhat coppery, with a broad black band across each incisure; on each side of the first segment a tuft of white hair, and a few more white hairs on the ventral surface, except these, the hair and bristles of the abdomen are all black. Bristles before the incisures rather long and erect. Hypopygium black, the lamellæ whitish or greyish. Coxæ, femora and hind tarsi including the extreme tips of the hind tibiæ, black. Tibiæ yellow. Fore and middle tarsi a little infuscated toward the tip; still the fourth joint of the middle tarsus is covered with white hair, and hence almost white in colour. Fore coxæ with white hairs and two black bristles. All the femora with white cilia below, longest on the front ones near the base. Front tibiæ on the upper side with a row of four successively longer bristles, the last conspicuously long and two-thirds of the way to the end. Bristles of the other tibiæ inconspicuous, the hind tibiæ rather hairy. Tarsi simple, the hind ones shorter than their tibiæ. Wings with an indistinct brown cloud along the front margin beginning beyond the end of the first vein and continuing to that of the second, reaching into the first posterior

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cell behind. The branch of the fourth vein makes an acute angle at its origin; third vein not recurved forward at its tip. Posterior cross-vein a little oblique, somewhat bicurved, less than half its length from the margin.

♀. Front scarcely ciliated, black bands of abdomen slightly wider; bristles of body shorter; those of fore tibiæ the same as in the male. The middle tibiæ also have large bristles, arranged on the same plan. Fourth joint of middle tarsus black; fore and middle tarsi rather darker than in the male.

Length 4 mm.; of wing, the same.

Altitude 500 feet. May. Four males and six females.

In immature specimens the wings are hyaline.

4. *Psilopus insularis*, n. sp.

Wings hyaline, tegular cilia black, legs including fore coxæ yellow, middle metatarsus of male ciliated.

♂. Face wide bluish-green with silvery pollen. Palpi black, with black hairs; proboscis yellow. Front wide and deeply excavated, bright blue or green. Antennæ black, the third joint rather long, rounded at the end. Arista dorsal, slender, rather long. In less mature specimens the third antennal joint is more or less shrivelled. Thorax bright blue-green, scutellum more violet. From above the root of the wing a distinct black stripe reaches the humerus, becoming attenuated anteriorly. Pleuræ green, white-dusted. Tegulæ and their cilia black. Halteres yellow. Bristles of moderate size, four large ones on the scutellum. Abdomen metallic-blue and green, with black bands nearly half the width of the segments. Hypopygium black, small, at the tip with a pair of small forcep-like organs of sordid grey colour. Bristles and hair of abdomen rather long, black, at the sides basally the hair is white. Legs wholly yellow, the tarsi but little darker. Front coxæ yellow with fine yellowish hair, and near the end two black bristles. Middle and hind coxæ black; the former with white hairs and one or two black bristles, the latter on the outside with a single black bristle and a few white hairs. Front and middle metatarsi longer than their tibiæ, the middle one with a dense row of short, blunt, slightly curved cilia on the upper edge. On the front side is a row of five or six small erect bristles. Hind tibiæ unusually hairy. This peculiarity extends over the metatarsus and decreases on the following joints. Wings hyaline; posterior cross-vein straight, not very oblique, distant two-thirds

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its length from the margin. The anterior branch of fourth vein makes an acute angle at its origin. Third vein not recurved forward at its tip.

♀ Colour less inclined to blue and violet; third joint of antennæ short: bristles shorter; black bands of abdomen narrower, comprising about one-third the segment. Middle metatarsi not ciliated; hind tibiæ and tarsi only a little hairy.

Length 4·5 mm.; of wing, the same.

Sea-level to 1000 feet. Nine males and numerous females.

Leptorhethum.

Aldrich, Kans. Univ. Quart., July, 1893.

1. *Leptorhethum angustatum.* (Pl. XII., fig. 108, wing of ♂.)

Aldrich, *l. c.*

♂. Small, green, legs yellow, abdomen yellow with green spots above, wings narrowed at base, cilia of tegulæ yellow. Face narrow, wider above and below (the eyes almost contiguous in the middle), white pollinose, showing a little of the green ground colour below the antennæ. Antennæ small, yellow, arista dorsal. Front bright-green, not excavated (this may be owing to a little extent to the shrivelled condition of the eyes in my only specimen), the lateral bristles small. Proboscis and palpi yellow. Thorax bright-green, the bristles mostly small. Pleuræ green, white pollinose, the hind margin yellow, halteres, tegulæ and their cilia yellow. Abdomen yellow; dorsum of first segment green except a line in front; second segment green on the last two-thirds above; third segment scarcely half green above, the colour not reaching the sides; fourth segment with only a small spot of green; fifth and sixth except the base and venter of the former, wholly green; hypopygium small, blackish, embedded, the small whitish lamellæ protruding. Legs, including coxæ, yellow; tarsi but little infuscated; front coxæ long, almost entirely bare; front metatarsi longer than the tibia. Middle tibiæ rather stout, above the middle on the fore side with a rather prominent bristle. Metatarsi longer, on the hind side with a very sparse row of small bristles, more dense near the end, where they are quite brush-like. The following joints simple, but oddly drawn up in my specimen. No noticeable bristles on fore or hind legs. Wings hyaline, third vein recurved, as figured. Length 2 mm.; of wing, 2·2 mm.

May. A single male.

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SYRPHIDÆ.*

Meromacrus.

Rondani, Esam. di var. sp. Ins. Bras., 10, 1848.

1. *Meromacrus pratorum.*

Syrphus pratorum, Fabricius, Syst. Ent., 765; Ent. Syst., iv., 286.
Eristalis pratorum, Fabricius, Syst. Antl., 236; Wiedemann, Auss. Zw. Ins., ii., 166.
Pteroptila pratorum, Osten Sacken, Catalogue, 113; Williston, Synopsis, 183.

Twelve specimens. Wiedemann's description applies well, save that it is not stated that the sutural thoracic band is interrupted. The species will be distinguished from *M. ruficrus* by the separated spots at the base of the abdomen; from all the other known species by the entirely yellowish red legs.

Eristalis.

Latreille, Hist. Nat. des Crust. et Ins., xiv., 363, 1804.

1. *Eristalis vinetorum.*

Syrphus vinetorum, Fabricius, Ent. Syst. Suppl., 562.
Eristalis vinetorum, Fabricius, Syst. Antl., 235; Wiedemann, Auss. Zw. Ins., ii., 163; Macquart, Dipt. Exot., ii., 2, 42; Williston, Synopsis North Amer. Syrphidæ, 171, pl. vii., fig. 8; Trans. Amer. Ent. Soc., xv., 280; Biologia Centr.-Amer. Dipt., iii., 63; F. Lynch, A. Dipt. Argentina, Syrphidæ, 116; Giglio-Tos, Dit. Messic., ii., 7.
Eristalis trifasciatus, Say, J. Acad. Sci. Phil., vi., 165; Compl. Wr., ii., 359.
Eristalis uvarum, Walker, List, iii., 623.

Hab. North, Central and South America, and the West Indies.

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* By S. W. Williston.

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VOLUCELLA.

1. *Volucella obesa.*

Syrphus obesus, Fabricius, Syst. Ent., 763. (For synonymy, see Williston, Biol. Centr.-Amer. Dipt., iii., 50.)

Six typical specimens of this cosmopolitan insect are in the collection.

Volucella, sp. n. ?

Three specimens belonging to the difficult group of *pallens, vesiculosa*, etc. I cannot find any description that will apply well to the specimens. They differ from *V. pallens*, Wied., in the presence of a median and two lateral facial stripes, in the hair of the mesonotum being for the most part black, and in the presence of a large black spot on the scutellum. From both *V. vaga*, Wied., and *V. hyaloptera*, Giglio-Tos, the facial stripe will distinguish the species, as well as other characters.

BACCHA.

Fabricius, Syst. Antl., 199, 1805.

1. *Baccha clavata.*

Syrphus clavatus, Fabricius, Ent. Syst., iv., 296.

Baccha clavata, Fabricius, Syst. Antl. 200; Wiedemann, Auss. Zw. Ins., ii., 94; Schiner, Nov. Exped., 341; Wulp, Tijdschr., v., Ent., xxvi., 10; Roeder, Stett. Ent. Zeit. 1885, 342; Williston, Trans. Amer. Ent. Soc., xv., 270; Biol. Centr.-Amer. Dipt., iii., 33; Giglio-Tos, Ditt. del Messic., ii., 57; Austen, Proc. Zool. Soc. Lond., 1893, 159; Hunter, Can. Ent., xxviii, 96.

Baccha bubista, Walker, List, iii., 549; Williston, Synopsis N. A. Syrph. 117, pl. iv., fig. 9 (Williston, Austen).

Baccha varia, Walker, List., iii., 549 (Austen).

Paragus scutellatus, Walker, Trans. Linn. Soc. Lond., xvii., 342 (Austen).

Baccha facialis, Thomson, Eugenies Resa, 504 (Williston).

Spaziqaster bacchoides, Bigot, Ann. Soc. Ent. Fr., 1883, 326 (Williston).

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Numerous specimens. The most northern habitat so far given for this species is Nebraska, by Hunter; the most southern one, Buenos Aires, by Lynch (Dipt. Argentina, Syrphidæ, 47). It is probably at home in all the intervening regions, as well as the adjoining islands.

Ocyptamus.

1. *Ocyptamus dimidiatus.*

Syrphus dimidiatus, Fabricius, Spec. Ins., ii., 434; Ent. Syst., 310; Wiedemann, Auss. Zw. Ins., ii., 140.
Scaeva dimidiata, Fabricius, Syst. Antl., 254.
Cheilosia dimidiata, Macquart, Dipt. Exot., ii., 2, 105.
Pipiza dolosa, Walker, Trans. Ent. Soc. New Ser., iv., 156 (Austen).
Pipiza divisa, Walker, *l. c.* (Austen).
Ocyptamus dimidiatus, Schiner, Nov. Exped., 346; Wulp, Tijdschr., v., Ent. xxvi., 10; Williston, Biol. Centr.-Amer. Dipt., iii., 30; Giglio-Tos, Ditt. del Messic., ii., 53; Austen, Proc. Zool. Soc. Lond., 1893, 134.
Baccha dimidiata, Williston, Synopsis N. A. Syrphidæ, 120, pl. v., fig. 10.

Hab. Central and South America, and the West Indies.

Allograpta.

Osten Sacken, Bull. Buff. Soc. Nat. Sc., iii., 49, 1876.

1. *Allograpta exotica.*

Allograpta exotica, Wulp (*nec* Wiedemann), Tijdschr., v., Ent., xxvi., 2, pl. i., fig. 2, Guadeloupe.

A single female specimen, agreeing fully with the description of what Wulp thought was Weidemann's *Syrphus exoticus*. In the Biologia Centr.-Amer. I considered Wulp's species doubtfully identical with *A. fracta*, O. S. Osten Sacken's species, however, does not have the scutellum broadly black, as did the specimens Wulp described, and as does the specimen from St. Vincent now before me. Wiedemann does not mention the spot on the scutellum, and I doubt very much that it was pre-

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sent in his specimen, as he could hardly have failed to mention it, so conspicuous is it. If his "schwarzlich Erzfarbe" means bright metallic green, or green-black, then there can be but little doubt that Osten Sacken's *A. fracta* is the same as *A. exotica*. In the work cited I mentioned a species from Mexico having an opaque, dark green mesonotum, which I thought might be the true *A. exotica*. Lynch is wrong in uniting it with the species having a shining mesonotum.

Mesogramma.

Loew, Centur., ii., 290, 1872.

I have refrained from naming any of the numerous species (with one exception) that have been described from North and South America, in this genus, convinced, as I am, that their great variability will require a thorough monographic treatment, with abundant material, to certainly distinguish them. Many of the species are very abundant in warm, sunny places.

1. *Mesogramma basilare*, var. ?

Syrphus basilaris, Wiedemann, Auss. Zw. Ins., ii., 43.
Mesogramma soror, Schiner, Nov. Exped., 350.
Mesograpta basilaris, Wulp, Tijdschr., v., Ent., xxxvi., 40, pl. i., fig. 8.
Mesogramma ——?, Williston, Biol. Centr.-Amer. Dipt., iii., 25.
Mesogramma basilare, Giglio-Tos, Ditt. del Messic., ii., 45.

Hab. Mexico, Brazil, Argentine Republic.

Ten specimens, labelled "Fitzhugh Valley, 500 feet, Cacao orchard." They differ very materially from the typical forms, but I believe that they represent a variety only. The female described by me in the work above cited certainly belongs with the males, though Giglio-Tos thinks that they differ too much to belong with them. The scutellum in these specimens has a narrow yellow border, and the abdomen is wholly red and yellow, the first segment alone excepted. There is a narrow, blackish, pre-apical ring on the hind femora, and the hind metatarsi are brownish; otherwise the legs are wholly

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yellow. The female has a broad median black stripe on the face, and the abdomen has obscure blackish markings, in the shape of two slender, approximated, median stripes; the hind margin of the segments is brownish.

2. *Mesogramma laciniosa.*

Mesogramma laciniosa, Loew, Centur., vi., 50.—Cuba.

Several female specimens I refer doubtfully to this species. The third and fourth abdominal segments have each two oval, oblique, black spots, and the posterior bands with a geminate, anteriorly dilated, slender prolongation in the middle, their anterior margin on each side concave; the fifth segment has three anterior, oval, black spots.

3. *Mesogramma boscii.*

Syrphus bosci, Macquart, Dipt. Exot., ii., 2, pl. xvii., fig. 2.

Syrphus gurges, Walker, Dipt. Saund., 236 (Osten Sacken).

Hab. Carolina, Alabama, Florida.

Several female specimens that agree with the description, save that the second abdominal segment is black, with a median, interrupted, yellow stripe. Mr. Hunter thinks that this species is identical with *M. parvula*, Loew, and he may be right.

4. *Mesogramma*, sp.

♂, ♀. Face yellow. Antennæ reddish yellow. Frontal triangle and the lateral margin of the female front yellow; vertical triangle black. Mesonotum with an entire yellow, lateral stripe. Scutellum black, with a yellow border. First two abdominal segments black, the first with the anterior angles, the second with a broad median, band yellow; third and fourth segments each with a quadrangular spot posteriorly on each side, and a small spot on the front margin, together with a median, partly obsolete, geminate stripe. Fifth segment with three spots. Legs yellow; hind femora with a broad black ring; hind tibiæ and tarsi brown; middle femora with a partly obsolete spot on the upper side distally. Length, 7–8 mm.

Sixteen specimens. The hind femora are a little stouter than usual.

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PIPUNCULIDÆ.

Pipunculus.

Latreille, Hist. Nat. des Crust. et Ins., xiv., 1804.

1. *Pipunculus aculeatus.* (Pl. XI., figs. 87, wing; 87*a*, antenna.)

Pipunculus aculeatus, Williston, Biol. Cent.-Amer. Dipt., iii., 88.—Mexico.

Five specimens. Agreeing quite with the description. I am not able to compare the type specimen, but I believe the determination is pretty certain. In most of the specimens, the middle of the hind femora is brown.

2. *Pipunculus politus*, n. sp. (Pl. XI., fig. 88, wing.)

♂, ♀. Small cross-vein situated at or beyond the tip of the first longitudinal vein; penultimate section of the fourth vein scarcely longer than the antepenultimate section; abdomen wholly shining. Length 4 mm.

Face and front black, silvery pubescent. Antennæ black, the third joint more or less yellowish at the tip, less produced than in *P. aculeatus*. Mesonotum shining, scarcely pollinose. Abdomen wholly shining black. Legs black; the extreme tip of the femora, the base of the tibiæ, and the first three or four joints of the tarsi yellow. Femora stout, without distinct spines on the underside. Wings hyaline; no stigmatic spot; small cross-vein opposite or a little before the middle of the discal cell; second longitudinal vein short.

Five specimens. In one of the specimens the small cross-vein is distinctly before the middle of the discal cell, and opposite the termination of the first vein.

TACHINIDÆ.

Cistogaster.

Latreille, Cuvier's Regne Anim., v., 1829.

1. *Cistogaster insularis*, n. sp.

♂, ♀. First three segments of the abdomen shining; first posterior cell petiolate. Length 5–6 mm.

♂. Front at the vertex about as wide as the length of the antennæ; bright golden yellow, with an opaque median black stripe. Antennæ black, the third joint at the base red, the second

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joint also, more or less reddish ; third joint a half longer than the second. Face ashy grey, somewhat yellowish in the middle below ; a slender black line on either side running from the root of the antennæ. Palpi reddish yellow. Dorsum of thorax opaque golden yellow, with two median slender stripes, and a lateral, broader one, anteriorly abbreviated, black. Abdomen wholly reddish-yellow, with black hairs ; fourth segment and the third, save an interrupted band, light golden opaque-yellow. Tegulæ light yellow. Legs black. Wings uniformly subhyaline ; first posterior cell closed at some distance from the margin.

♀. Sides of front and the face silvery grey, a little yellowish near the vertex. Mesonotum densely yellowish grey pollinose, with two median brown lines and a broad, shining, black stripe on each side. Abdomen shining black, the third and fourth segments opaque greyish white, save a posterior interrupted band on the third, and two small spots on the fourth. Tegulæ white.

Six males and two females. The species closely resembles some of the varieties of *C. occidua,* Walker, but seems sufficiently distinct in the pollinose markings of the abdomen and the petiolate first posterior cell, which is closed at some distance from the margin.

Trichopoda.

Latreille, in Cuvier's Regne Animal., v., 512, 1829.

1. *Trichopoda pennipes.* (Pl. XI., fig. 100, wing.)

Musca pennipes, Fabricius, Ent. Syst., iv., 348.
Dictya pennipes, Fabricius, Syst. Antl., 327.
Trichopoda pennipes, Wiedemann, Auss. Zw. Ins., ii., 274 ; Desvoidy, Myodaires, 288 ; Wulp, Tijdschr., v., Ent., xxvi., 15 ; Biol. Centr.-Amer. Dipt., ii., 3 ; Brauer and Berg., Musc. Schiz., i., 79.
Phasia jugatoria, Say, Compl. Wr., ii., 64.

Hab. United States; West Indies ; Central and South America.

Five specimens.

Elachipalpus.

Rondani, Esap. Ditt., Ann. di Bologna, 1850.

1. *Elachipalpus macrocerus.* (Pl. XI., fig. 99, wing.)

Tachina macrocera, Wiedemann, Auss. Zw. Ins., ii., 290.

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Cuphocera macrocera, Schiner, Nov. Exped., 330; v. d. Wulp, Tijdschr., v., Ent., xxvi., 22.

Elachipalpus macrocerus, Brauer and Berg., Musc. Schizometopa, ii., 102.

Hab. Brazil.

Five specimens, agreeing with others from Brazil in my collection.

JURINIA.

Rob. Desvoidy, Myodaires, 34, 1830.

1. *Jurinia*, sp. (Pl. XI., fig. 88*a*, antenna.)

♂, ♀. In structure and size almost identical with *J. apicifera*, Walk. Front shining black, through the rather thin pollen. Mesonotum shining green-black, very thinly pollinose. Tegulæ deep brown. Abdomen deep blue-black throughout. Otherwise as in *J. apicifera*.

This species is different from any that I know, either from North or South America, and may be new. Still, the wide distribution of the species of this genus renders it probable that it has been described from other regions in America.

2. *Jurinia apicifera*. (Pl. XI., fig. 89, antenna.)

Jurinia apicifera, Walker, List, iv., 720; Williston, Trans. Amer. Ent. Soc., xiii., 300; Townsend, Trans. Amer. Ent. Soc., xix., 90, xxii., 70; Calif. Acad. Sci., iv., 618.

Hab. United States; Canada; San Domingo; Mexico.

Numerous specimens which agree quite with others from various localities in the United States, Canada, and San Domingo.

GONIA.

Meigen, Illiger's Mag., ii., 1803.

1. *Gonia pallens*. (Pl. XI., fig. 90, antenna of ♂.)

Gonia pallens, Wiedemann, Auss. Zw. Ins., ii., 346; Macquart, Dipt. Exot., ii., 3, 50; E. Lynch, A., An. Soc. Cient. Arg., x., p. viii.; v. d. Wulp, Tijdschr. voor Ent., xxvi., 23; Biologia Cent.-Amer. Dipt., ii., 39; Townsend, Trans. Amer. Ent. Soc., xix., 95.

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Gonia chilensis, Macquart, Dipt. Exot., ii., 3, 51, pl. v., fig. 4; Blanchard, Gay's Hist. Fis. y. Pol. de Chile, vii., 422, pl. iv., fig. 20; Roeder, Stett. Ent. Zeit., 1885, 345.

Gonia angusta, Macquart, Dipt. Exot., ii., 3, 51, pl. 5, fig. 5; Walker, List, iv., 798.

Gonia lineata, Macquart, Dipt. Exot. Suppl., iv., 178.

Hab. South America; Mexico; West Indies.

One specimen, which with much probability is conspecific with those from Cuba, referred to *G. chilensis*, by Macquart. That the species is the same as *G. pallens* is, to me, somewhat doubtful. It therefore seems worth while to give a better description of our specimen.

♂. Claws small: sides of the face with bristles; third joint of the antennæ seven or eight times as long as the second joint. Front and face light yellow, silvery white pollinose, the sides of the front subtranslucent, as though oiled; sides of the face with sparse, short, black bristles. Cheeks bare. Antennæ black. Median depression of the face wider than the sides; no bristles on its ridges. Dorsum of thorax grey pollinose, somewhat shining. Scutellum largely yellow. Abdomen narrow; yellowish red; first segment under the scutellum, second and third with a slender median stripe, and the posterior part of the fourth black; pollen inconspicuous, except posteriorly. Tegulæ white. Wings subhyaline; the costal, subcostal, and marginal cells markedly yellow; veins elsewhere narrowly clouded with the same yellow colour or a dark brown. Claws and pulvilli small, not as long as the last joint of the tarsi. Length 11 mm.

Phorocera.

Rob. Desvoidy, Myodaires, 131, 1830.

1. *Phorocera* (*Prospherysa*?) *puer*, n. sp. (Pl. XI., fig. 91, head of ♂.)

♂. Eyes very sparsely pilose, the scattered hairs visible only under careful examination. Front about as wide as the eye, the lateral, silver-grey margins narrower than the broad, brownish-red, median stripe; the frontal bristles reach nearly to the base of the third antennal joint. First and second joints of the antennæ red; third joint black, four or five times as long as the second. Face and cheeks silver-grey, the lower part of the face and the cheeks

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yellowish in ground colour. Mesonotum thickly grey pollinose, with five black stripes, the lateral ones interrupted. Abdomen flattened ovate; shining black, with the anterior part of the second and third segments opaque grey; first segment without median bristles; second segment with a pair of marginal ones; third segment with a posterior row; fourth segment bristly on the posterior half. Legs black; claws elongate. Calyptræ white. Wings cinereous hyaline. Length 4½ mm.

One specimen. *Prospherysa* seems to differ from *Phorocera* only in the bare eyes, and the eyes of this specimen are, practically bare, so that it is a question whether or not this species should not be located in that genus. The cross-veins on the outer side of the wing are more than usually oblique, still hardly as much so as in *Plagia*. The genus *Plagioprospherysa*, Towns., which is synonymous with *Prosopodes*, B. and B., was based upon this character alone, and is to me hardly entitled to acceptance.

Exorista.

Meigen, Illiger's Mag., iii., 1803.

1. *Exorista nobilis*, n. sp. (Pl. XI., fig. 92, head of ♂.)

♂. Front somewhat prominent, only a little narrowed behind; above, equal to about one-fourth of the width of the head; light golden-yellow in colour, with an opaque black stripe, which is narrowed above; vertical bristles strong; ocellar bristles small, proclinate; the single row of frontal bristles descends nearly to the base of the third antennal joint; the sides have only a few short weak hairs. Sides of the face yellow above, silvery below; in width not equal to one-third of that of the median depression; four or five bristles on the vibrissal ridges, extending, in some cases, nearly to the middle of the face; median depression silvery-white. Cheeks narrow, bare, silvery. Proboscis black; palpi and labella yellow. Antennæ nearly black, the first two joints and the base of the third rufous; third joint five or six times as long as the second. Thorax densely grey pollinose; mesonotum with two slender median stripes, reaching from the pronotum to beyond the suture; and a broad shining stripe on each side, interrupted by the suture, and abbreviated in front and behind. Scutellum grey, with six bristles. Abdomen elongate and narrow, black throughout; the second, third, and fourth segments broadly and

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densely grey pollinose in front; first and second segments with a single pair of strong median bristles; third segment with a posterior row; fourth bristly on the posterior half. Legs black; posterior surface of the front femora broadly grey pollinose; claws and the yellowish-brown pulvilli nearly as long as the last two joints taken together; hind tibiæ with strong, unequal bristles on the posterior side. Tegulæ white. Wings nearly hyaline, or with a light blackish tint; small cross-vein a little before the middle of the discal cell.

♀. Front less yellowish, and with orbital bristles; pulvilli and ungues not longer than the fifth tarsal joint.

Length 9–11 mm.

Five specimens. This species is, apparently, an *Exorista* in the sense of Brauer and Bergenstamm.

Atrophopoda.

Townsend, Trans. Amer. Ent. Soc., xix., 373, 1892; *Vanderwulpia*, Townsend, Trans. Amer. Ent. Soc., xix., 381, 1892; *Microchira*, Brauer and Bergenstamm, Musc. Schizometopa, iii., 138, 1893; *Wulpia*, Brauer and Bergenstamm, *l.c.*, 1893.

1. *Atrophopoda townsendii*, n. sp. (Pl. XI., figs. 93, head and part of antenna of ♂; 93*a*, tarsus of ♂; 93*b*, tarsus of ♀; 93*c*, wing.)

♂, ♀. Frontal row of bristles descending to the lower border of the eyes; eyes bare; costa with spine; first posterior cell long petiolate. Male claws and pulvilli not enlarged. Length 4–5 mm.

Front shining bluish beneath the silvery pollen, the median stripe black. Face silvery; sides narrow. Antennæ black; second joint red; third joint seven or eight times longer than the second in the male; in the female more slender and a little shorter; arista in the male bare, in the female with long pubescence, subplumose. Palpi yellow, a little dilated at the tip. Thorax bluish-grey, opaque; mesonotum with two, rather broad, deep-brown stripes, extending from the front margin to the scutellum. Abdomen long-ovate in shape: opaque bluish-grey; the first segment and the posterior part of the second and third segments shining black, the black reaching well toward the front margin in the middle; first, second, and third segments with a pair of erect marginal bristles; third segment with a single lateral one; fourth segment with a posterior row. Legs black; pulvilli and ungues of the male small on all the feet; of the female, rudimentary on the front pair, the terminal joints

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compressed. Wings brownish, deeper along the veins, hyaline on the posterior margin, first posterior cell closed and rather long petiolate, terminating in the margin a little distance before the tip; costa with spine; third vein bristly before the cross-vein, the first vein bare.

Southern end of the island. May. Open ground, near sea, on herbage. Six females and two males.

2. *Atrophopoda braueri*, n. sp. (Pl. XI., figs. 94, head of ♂; 94*a*, tarsus of ♀; 94*b*, tarsus of ♂; 94*c*, wing.)

♂, ♀. Frontal bristles descending to the border of the eyes; eyes very sparsely hairy; arista pubescent in the female; costa with spine; first posterior cell narrowly open at the tip; all the claws and pulvilli of male much elongated. Length 5–6 mm.

Face a little less receding than in *A. townsendii*, narrower, and the front of more equal width. Third joint of antennæ not more than four times the length of the second joint. Sides of front light-yellow pollinose. Face silvery-white; median frontal stripe black. Antennæ deep brown or black; the second joint red; arista in the male bare, or almost imperceptibly pubescent; in the female distinctly pubescent. Thorax silvery-grey, with two broad, deep brown or black stripes extending the full length of the mesonotum. Abdomen long-ovate, shining black, the anterior portion of segments two, three, and four silvery-grey; first segment with lateral, but no median bristles; second segment with lateral and a pair of marginal bristles; third and fourth segments with a posterior row. Legs black; all the claws and pulvilli of the male much elongated; those of the four posterior feet of the female small, on the front feet rudimentary, and their terminal tarsal joints compressed. Wings nearly uniformly brownish or sub-hyaline; first vein with hairs throughout; third vein with hairs as far as the small cross-vein: first posterior cell terminating near the tip of the wing, narrowly open, its angle obtuse and without stump.

Twenty specimens.

It will be seen from the generic synonymy given above that I take a different view of the value of the characters in this genus, from that of Messrs. Townsend, Bergenstamm, and Brauer. I am opposed to the principle that a genus is necessary for every described species in this family, and refrain from here adding two more for the preceding

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species. It is with much regret that I reduce the above names to synonyms, for the worthy entomologist whose name they commemorate deserves better at the hands of his zealous confreres.

There are now seven known species:—*A. singularis*, Towns.; *Vanderwulpia atrophopodoides*, Towns.; *V. sequens*, Towns.; *Microchira mexicana*, B. & B.; *Wulpia aperta*, B. & B.; and the ones described above—all markedly characterized by the rudimentary front claws of the female, and having the general markings and structure all very similar. No two, however, save perhaps the two species of *Vanderwulpia*, agree in their structural characters. Townsend made the error, apparently, of mistaking females for males, describing the front claws as rudimentary in both sexes, while, without doubt, in all the species they are alone rudimentary in the female.* Perhaps a grouping of the described characters will bring out more clearly the value of those which have been used for distinguishing the genera.

Eyes hairy. *A. singularis, M. mexicana, A. Braueri.*

Frontal bristles descending to the cheeks. *A. singularis, A. Townsendi, A. Braueri.*

Frontal bristles not descending below antennæ. *V. atrophopodoides, V. sequens, M. mexicana, W. aperta.*

First posterior cell open. *A. Braueri, W. aperta.*

First posterior cell closed in the margin or short petiolate. *A. singularis, V. sequens.*

First posterior cell long petiolate. *V. atrophopodoides, A. Townsendi.*

Costal spine present. *A. singularis, M. mexicana, W. aperta, A. Townsendi, A. Braueri.*

Male claws normal. *A. Townsendi.*

Male claws elongate. *A. Braueri.* (Other males unknown.)

Undoubtedly other mutations of these characters will appear among species yet to be made known.

I will add, that, in the two males of *A. Townsendi*, there is a single, well-developed orbital bristle; in the males of *A. Braueri*, there are none; in all the females there are two.

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* Townsend has since recognized the males, and suspects that *Lachnomura*, Towns., is also a synonym of this genus (Trans. Amer. Ent. Soc., xxxii., 77, 1895).

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Didyma.

V. d. Wulp, Biologia Centrali-Amer., Diptera, ii., 156, 1890.

1. *Didyma calyptrata*, n. sp. (Pl. XI., fig. 95, head of ♂.)

♂. Front above equal to about one-fourth of the width of the head, a little broader below; silvery grey on the sides, the median stripe black, narrower above, and narrower than the sides. Sides of the face grey, the median depression darker. The frontal bristles descend as far as the base of the third antennal joint, and nearly as far as the uppermost of the vibrissal bristles. Eyes clothed thickly with dusky pile. Antennæ black, shorter than the face, the third joint four or five times longer than the second; arista thickened at the base. Proboscis black, the palpi yellowish. Thorax black; mesonotum shining, very thinly pollinose, and without distinct stripes. Scutellum black. Abdomen short-oval; black, with thinly pollinose bands on the anterior part of the segments; first and second segment with marginal bristles; third with a posterior row; fourth with the posterior part bristly. Legs black; hind tibiæ with unequal bristles. Tegulæ large, yellowish-white. Wings greyish-hyaline; small cross-vein at the middle of the discal cell; angle of fourth vein broadly rounded; first posterior cell terminating just before the tip, narrowly open. Length 4 mm.

Two specimens. The female specimen has the front broader, the eyes sparsely pilose, the mesonotum more distinctly pollinose, and with two narrow black stripes in front; the abdomen broader, and the marginal bristles of the first and second segments possibly wanting. There is a pair of orbital bristles present in both sexes.

Degeeria.

Meigen, Syst. Beschr., vii., 249, 1838.

1. *Degeeria nigriventris*, n. sp. (Pl. XI., fig. 96, head of ♂.)

♂. Abdomen shining black; discal bristles present; wings hyaline. Length 4 mm.

Front only a little narrower above, equal in width to about one-fourth of that of the head; median stripe very broad, opaque-black; sides grey, at the vertex shining black. Face opaque-grey, sides very narrow; vibrissal row of bristles extending

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nearly to the base of the third joint, and nearly to the lowermost one of the frontal row. Antennæ black, reaching very nearly to the vibrissæ; third joint six or seven times as long as the second. Mesonotum shining black, the sides in front pollinose. Abdomen shining black; first segment with marginal bristles; second and third segments with both marginal and discal ones, the latter with two additional posterior ones on each side; fourth segment bristly on the posterior part. Legs black. Tegulæ nearly white. Wings hyaline; posterior cross-vein straight, situated in the middle between the anterior cross-vein and the bend of the fourth vein, the angle obtuse and without stump; last section of the fourth vein gently concave, terminating very near the tip of the wing. No costal spine.

Three specimens.

Beskia.

Brauer and Bergenstamm, Denksch. K. Acad. Wissensch., lvi., 139, 1889; *Ocypterosipho*, Townsend, J. N. York Ent. Soc., ii., 79, 1894.

1. *Beskia cornuta.* (Pl. XI., figs. 97, head of ♂; 97*a*, wing.)

Beskia cornuta, Brauer and Bergenstamm, Dencksch. K. Acad. Wissench., lvi., 139, fig. 276.

Ocypterosipho willistoni, Townsend, *l. c.*

Hab. San Domingo (Coll. Williston), Brazil (B. B.).

Several specimens; agreeing well with the description.

DEXIIDÆ.

Rhynchodexia.

Bigot, Bullet. Soc. Ent. Fr., 1885, p. xi.

1. *Rhynchodexia sororia*, n. sp. (Pl. XI., fig. 98, head of ♂.)

♂, ♀. Thorax and scutellum cinereous, with black stripes. Abdomen of male red, with a black stripe; of the female, black; palpi yellow, brown at the tip. Legs black. Length 9–13 mm.

♂. Head light opaque, golden-yellow, the cheeks more ashy; ground-colour of the lower part of the face and the cheeks yellow. First two joints of the antennæ, and the base of the third, red; third joint a little more than twice the length of the second; arista

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thickened on the basal portion, plumose; second antennal joint prominent, and with bristles. Proboscis black; palpi slender, yellow, brownish at tip, a little broader on the distal portion. Mesonotum cinereous, with variable reflections, and with three broad black stripes, and on each side of the median stripe a narrow black line; scutellum cinereous, its base black and tip red. Abdomen conical, yellowish red, with a broad black stripe, sometimes interrupted at the sutures; cinereous pollinose, variable in different reflections; clothed with short black hairs and stout macrochætæ, as follows: three or four lateral ones on the first segment, as many lateral ones on the second segment, and three pairs of median ones; anterior, lateral ones, and a thick-set posterior row on the third segment; the fourth segment covered. Legs black, the middle of all the tibiæ red or reddish; front femora with a conspicuous row of long bristles on the under side; middle femora with a fewer number forming a similar row; hind tibiæ with about three pairs on the posterior side; claws and the yellowish brown pulvilli somewhat longer than the last tarsal joint. Tegulæ yellow. Wings cinereous hyaline, the anterior cells yellowish; small cross-vein at the middle of the discal cell; angle of fourth vein rounded.

♀. Front above less than one-fourth the width of the head; a pair of reclinate vertical, and two pairs of orbital bristles present. Abdomen black, with strong white reflections; the fifth segment red; first segment with a single lateral bristle; second with one lateral and discal and marginal; third segment with a discal pair and posterior row; fourth segment wholly covered.

Numerous specimens. This species is apparently an *Eudexia*, B. & B., and seems nearest allied to *R. fraterna*, v. d. Wulp.

SARCOPHAGIDÆ.

Sarcophilodes.

Brauer and Bergenstamm, Denkschr. der K. Acad. Wissensch., lvi., 164, 1889.

1. *Sarcophilodes puella*, n. sp. (Pl. XII., fig. 120*bis*, head of ♂.)

♂, ♀. Front broad, the median stripe scarcely one-third of its breadth; at the upper corner of the eyes with two bristles, the inner longer one recurved, the outer one directed obliquely outward; a pair of proclinate ocellar bristles; and two orbital bristles, the upper one reclinate the lower one proclinate; on either side of

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the median stripe with about four or five rather strong bristles; front of the female of the same width as that of the male, but with two additional proclinate, orbital bristles. Third joint of the antennæ not more than three times the length of the second, the arista moderately plumose on the basal half. Sides of the face and the cheeks bare, the latter with bristles on the lower margin. Mesonotum with well-developed centro-dorsal bristles extending in front of the suture. Scutellum with two well-developed bristles on each lateral margin, but without a marginal apical pair. Abdomen short, oval; second and third segments each with a pair of marginal bristles, the third with two additional lateral marginal ones, and the fourth with a posterior row; hypopygium without bristles. Tibiæ without long hair, the bristles irregular. Third vein of the wings setulose at the proximal end, the distal section not sinuous; anterior cross-vein nearly opposite the end of the first vein and at the middle of the discal cell, the distance from the anterior cross-vein to the posterior cross-vein equal to the length from the latter to the angle; posterior cross-vein much less oblique than the apical cross-vein; angle of the fourth vein with a fold, but not distinctly appendiculated; first posterior cell narrowly open before the border of the wing. Head yellowish-grey; frontal stripe red or brownish-red; antennæ black. Mesonotum with three deep brown stripes, about as wide as the grey between them. Abdomen oqaque yellowish-grey, changeable in different reflection, with a median stripe and a row of three rather small spots on each side; hypopygium grey. Legs black. Wings hyaline. Length 4 mm.

Numerous specimens. St. Vincent. The present species does not wholly agree with the definition of the genus, as given by Brauer and Bergenstamm. It differs in having the first posterior cell open and inappendiculate, and in having the hypopygium rather small. It may be a *Sarcophagula*, Wulp.

Sarcophaga.

Meigen, Syst. Beschr., v., 14, 1826.

Table of Species.

1. Hypopygium or anal segments red 2
   Hypopygium or anal segments black or grey 5
2. Hypopygium large, with abundant black hair and without bristles; scutellum with three pairs of stout bristles; posterior tibiæ of males with long hair . . *otiosa*, n. sp.
   Tibiæ of male without long hair 3

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3. First segment of the hypopygium with well-developed bristles on its posterior margin; first longitudinal vein with a few bristles at its proximal end; scutellum without apical bristles. . . . . *chætopygialis.*
   First segment of the hypopygium without bristles on its hind margin; scutellum with a pair of apical bristles . 4
4. Hypopygium large, both segments red, black hair; meso-notum without black bristles in front. *concinnata*, n. sp.
   Hypopygium small, its first segment black . . *pavida*, n. sp.
5. First longitudinal vein without bristles . . *micropygialis*, n. sp.
   First longitudinal vein with bristles . . . . . sp.

1. *Sarcophaga micropygialis*, n. sp.

♂. Front above in width less than the length of the third antennal joint; vertex with two strong proclinate bristles, a little in advance of the ocelli another, smaller, pair of reclinate bristles, apparently the beginning of the rather long ones composing the frontal rows; ocelli with two proclinate bristles. Sides of the face narrow, not more than one-half the width of the median flattened surface; a row of minute bristles near the eyes, otherwise bare. The bare, hair-like tip of the arista about as long as the plumose portion. Cheeks with black hair, on the inferior margin with black bristles, reaching to the stout vibrissæ, which are situated only a little distance above the oral margin. In colour, the sides of the front and face, the cheeks and the posterior orbits are light golden yellow, opaque central portion of the face grey; frontal stripe and the antennæ black. Black stripes of the mesonotum broad; the mesonotum with black hair and with four rows of well-developed bristles, reaching to the front part. Scutellum with four stout bristles, and in the middle of the apical border a pair of minute bristles, closely approximated. Abdomen black, scarcely at all shining, the second and third segments each with four oval spots, somewhat variable in different reflections; third segment with a pair of median marginal bristles; fourth segment with a strong, posterior row of bristles, and an oval black spot on each side anteriorly; hypopygium small, black, grey or yellowish-grey pollinose, its first segment with a row of black bristles before its posterior margin. Legs black; middle tibiæ with a single stout bristle on its posterior side near the middle; hind tibiæ with several bristles and without long hair on the inner side; pulvilli long. Wings nearly hyaline; first longitudinal vein without bristles; third vein with bristles for more than half the distance to the

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anterior cross-vein, the latter situated at the middle of the discal cell; distance from the anterior cross-vein to the posterior cross-vein more than three times that from the latter to the angle of the fourth vein. Length 9 mm.

2. *Sarcophaga concinnata*, n. sp.

♂. Agrees with *S. otiosa* throughout, except that the middle and hind tibiæ are wholly without the thick long hair on the inner side, and the femora have less hair below. The specimens, moreover, seem to be less thickly hairy than in that species, and the size is less. Length 9–11 mm.

With the three specimens presenting the above characters, there are four females which may belong with them, but from their larger size, I suspect are *S. otiosa*. The front is broader than in the males; there are four well-developed bristles along the orbit and two orbital, proclinate bristles; the black stripes of the mesonotum seem a little narrower; the fifth abdominal segment is red, the legs are without the long hair, and the claws are a little shorter. It is possible that the species is identical with *S. chrysostoma*, Wied.

3. *Sarcophaga otiosa*, n. sp.

♂. Front narrow above, at the vertex the width is about equal to the length of the third antennal joint; at each superior angle of the eyes there is a stout bristle directed backwards; a little way in front of these there is a single, smaller bristle on each side; along the edge of the frontal stripe, a row of thick-set bristles, short above, but becoming successively longer below. Sides of the face bare, except a row of minute bristles situated close to the eyes. The antennæ reach nearly to the stout vibrissæ; arista long and densely plumose. Cheeks light-golden pilose, with a row of black bristles on the inferior margin, reaching to the vibrissæ; vibrissæ situated at some distance above the oral margin. In colour, the sides of the front and of the face are opaque, light golden-yellow, the frontal stripe, the antennæ, and the vibrissal ridges black, the last greyish pollinose. Stripes of the mesonotum broad and deep black; mesonotum with abundant black hair, but without bristles, except on the posterior part. Scutellum with three pairs of stout bristles, the apical pair approximated and cruciate. Abdomen marmorate, metallic-black and yellowish-grey, variable in different

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reflections; third segment with two or four, median, marginal bristles and two lateral ones; fourth segment with a row of strong marginal ones; hypopygium large, reddish-yellow, thickly clothed with black hair or pile, its first segment without bristles. Legs stout, metallic-black; front femora pollinose behind; middle tibiæ, except on the basal third, and the hind tibiæ throughout, with abundant long black pile; all the femora have rather abundant pile on the under-side; middle tibiæ with a single stout bristle on the outer-side, near the middle, the hind tibiæ with four or five, besides the terminal ones. Wings nearly hyaline; first longitudinal vein bare, the third with a few bristles at the extreme base; outer cross-veins in nearly the same straight line, the posterior cross-vein joining the fourth vein beyond the middle of the distance between the anterior cross-vein and the angle. Claws elongate. Length 12–13 mm.

Five specimens There are no ocellar bristles. It is not improbable that the female of this species is that mentioned under the preceding.

4. *Sarcophaga pavida*, n. sp.

♂. Width of the front above greater than the length of the third antennal joint; at the angle of the eyes above a strong reclinate bristle; below the ocelli on either side, forming the beginning of the frontal row (the bristles of which are distinctly smaller) there are two, strong reclinate bristles; ocelli with two small, proclinate bristles. A row of minute bristles on the sides of the face near the eyes; otherwise bare. Cheeks with yellow hair and with black bristles on its lower margin. In colour, the sides of the front of the face, the cheeks, and the posterior orbits are light golden-yellow, the median facial depression grey, the frontal stripe and the antennæ black. Black stripes of the mesonotum rather broader than the intervening grey stripes; bristles of the mesonotum extending to the front. Scutellum with two stout bristles on each lateral border, and a pair of smaller, approximated, cruciate ones at the tip. Abdomen black, shining; the second, third and fourth segments each with four oval, grey spots, changeable in different reflections; third segment with median marginal bristles; hypopygium small, its first segment yellowish-grey, almost wholly concealed, the posterior segment shining-red, with black hair. Legs black; middle tibiæ with two median exterior bristles, the lower one stout; hind tibiæ without hair on the inner side. Wings greyish-hyaline; first longitudinal vein without bristles; outer cross-veins in nearly the same direction;

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anterior cross-vein at the middle of the discal cell; the distance between the cross-veins is less than three times that from the posterior one to the angle. Length 9 mm.

♀. A single strong reclinate bristle at the beginning of the frontal row; two proclinate, orbital bristles on each side; fifth abdominal segment very small, nearly concealed, red; front a little broader above.

Four specimens. St. Vincent.

5. *Sarcophaga chætopygialis*, n. sp.

♂. Width of the front above less than the length of the third antennal joint; a stout reclinate bristle at the angle of the eyes, another, less strong, forming the beginning of the frontal rows; and a pair of small, proclinate ocellar bristles. Bristle of the antennæ plumose nearly to the extremity. Sides of the face bare; cheeks with black hairs. The dorso-central bristles of the mesonotum extend to the front; black stripes of the mesonotum much broader than the grey intervals. Scutellum with two stout bristles on each side, and without the apical pair. Abdomen shining black, with four rows of grey spots, only moderately changeable in different reflections. Hypopygium prominent, shining red, the first segment with well-developed bristles on its hind margin; hair sparse, black. Wings distinctly greyish-hyaline; first and third veins with bristles; posterior cross-vein distinctly less oblique than the apical cross-vein; anterior cross-vein at the middle of the discal cell. Length 7–8 mm.

♀. Front a little broader above; anal segment red, small, nearly concealed; front with orbital bristles.

Numerous specimens. St. Vincent.

MUSCIDÆ.

Musca.

Linné, Fauna Suecica, 1763.

1. *Musca domestica.*

Musca domestica, Linné, etc.—Cosmopolitan.
Musca harpyia, Harris, Ent. Correspond., 335.—North America.

Stomoxys.

Geoffroy, Hist. des Ins., i., 1764.

1. *Stomoxys calcitrans*, Linné, etc.—Cosmopolitan.

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Lucilia.

Robineau Desvoidy, Myodaires, 452, 1830.

1. *Lucilia (Compsomyia) macellaria.*

Musca macellaria, Fabricius, Syst. Ent., 776 (for the extensive bibliography and synonymy, see Lynch A., An. Soc. Cient. Arg., x., 71, 233).—North and South America.

2. *Lucilia ruficornis.*

? *Lucilia ruficornis,* Macquart, Dipt. Exot. 1er Suppl., 198; Schiner, Reise der Novara, Dipt., 304; Roeder, Stett. Ent. Zeit., xiii., 347; Bigot, in Ramon de la Sagra. Nat. Hist., 821.—Colombia (Macq.), Chile (Schiner), Cuba (Bigot), Porto Rico (Roeder).

? *Lucilia cluvia,* Walker, List, iv., 885.—West Indies.

? *Musca insularis,* Walker, Dipt., Saund., 340.—West Indies.

I do not feel quite sure of the determination.

ANTHOMYIIDÆ.

Ophyra.

Robineau Desvoidy, Myodaires, 516, 1830.

1. *Ophyra ænescens.* (Pl. XII., figs. 120, head of ♂; 120*a*, wing.)

Anthomyia ænescens, Wiedemann, Auss. Zw. Ins., ii., 435.—New Orleans, West Indies.

Ophyra ænescens, Macquart, Dipt. Exot. 1er Suppl., 203; Roeder, Stett. Ent. Zeit., 1885.—Texas (Macq.), Porto Rico (Roeder).

♂. Deep shining green black, the face and legs black. Eyes nearly contiguous. Front below with short bristles. Antennæ dark-red; arista slender, bare. A small spot in the middle above the antennæ; the face and the cheeks light, silvery pollinose; oral and cheek bristles small. Proboscis short; palpi yellow. Abdomen ovate, with rather dense, erect, black hair; bristles at the tip slender and not long. Wings lightly tinged with brown. Hind tibiæ simple. Length 5 mm.

One specimen. St. Vincent.

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Lispa.

Latreille, Precis, etc., 1796.

1. *Lispa uliginosa.*

Lispa uliginosa, Fallen, Dipt. Suec. Musc., 93; Loew, Stett. Ent. Zeit., viii., 24; Kowarz, Wien. Ent. Zeit., xi.—Europe, North America.

Six specimens. St. Vincent.

Cyrtoneura.

Macquart, Hist. Nat. Dipt., ii., 274, 1835.

1. *Cyrtoneura maculipennis*, n. sp. (Pl. XII., figs. 121, head of ♂; 121*a*, wing.)

♂. Eyes bare, separated at the vertex by a space not twice the width of the ocellar tubercle. Front with a median, narrow, black stripe, broader at the lower end; orbits silvery-grey, with a single row of bristles, descending as far as the proximal end of the second joint of the antennæ. Ocellar tubercle with two strong proclinate bristles. Antennæ black, the second joint and the immediate base of the third largely yellowish, the third joint reaching nearly to the strong oral bristles; arista long plumose. Face light-grey pollinose. Proboscis and palpi black. Mesonotum lightly grey pollinose; in some lights with two slender, interrupted stripes on each side, and the beginning of two median ones in front. Scutellum grey pollinose, large, triangular, with two approximated bristles at its apex. Pleuræ black, only slightly pollinose. Abdomen short and broad, greyish-yellow pollinose, somewhat variable in different reflections, the shining ground-colour showing through; clothed with short bristly hairs and with moderately long bristles at the tip. Legs wholly black. Wings greyish-hyaline, or uniformly tinged with pale brownish; a small blackish spot at the tip of the auxiliary vein, and one on the anterior cross-vein; the posterior cross-vein, which is nearly straight and rectangular to the fifth vein, is lightly clouded; first posterior cell slightly narrowed in the margin. Tegulæ nearly white, the upper one smaller than the under one. Halteres yellow. Length 4½–5½ mm.

♀. Front less than one-third of the width of the head, the median black stripe broad, and of equal width. Pulvilli a little smaller than in the male. Abdomen grey, with irregular light-brown markings.

Six specimens. St. Vincent.

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LIMNOPHORA.

Robineau Desvoidy, Essai sur les Myod., 517, 1830.

1. *Limnophora exilis*, n. sp.

♂. Front long, the eyes very nearly contiguous below the ocelli, leaving a very narrow space in which there are rows of long slender bristles; below, the opaque black of this space broadens out into the frontal triangle, leaving the orbits narrowly silvery. Antennæ black, the third joint not reaching to the vibrissal bristles; arista bare. Face lightly grey pollinose; epistoma but very little projecting; cheeks very narrow. Mesonotum shining black the lateral margins in front of the suture, the pleuræ and the abdomen, where not spotted, light-grey pollinose. Scutellum shining black. Abdomen ovate, the first segment in large part, the second and third each with three large, subconfluent, subopaque, black spots; fourth segment for the most part shining. Legs black; hind tibiæ with long black pile on the inner side; pulvilli not elongated. Wings yellowish hyaline; penultimate section of the fourth vein shorter than the posterior cross-vein, the latter rectangular. Palpi black. Length 3½ mm.

Two specimens. St. Vincent.

2. *Limnophora debilis*, n. sp.

♂. Eyes nearly contiguous below the ocelli. Front silvery white, with a large, opaque, black triangle below, with two rows of erect black bristles. Antennæ dark-brownish red; arista bare. Face silvery grey. Thorax black; mesonotum densely light yellowish-grey pollinose, with three complete and two incomplete, narrow, dark-brown stripes. Pleuræ densely light, grey pollinose. Scutellum of the same yellowish-grey colour as the dorsum of the thorax, with a discal, dark-brown spots; it is large and triangular, and has a pair of apical cruciate bristles, and one on each border. Abdomen ovate, opaque light yellow; first segment on the sides and the fourth segment for the greater part black, covered with light-yellowish pollen; second and third segments each with a pair of dark-brown, opaque spots. Legs black, the knees yellow; hind tibiæ not hairy. Tegulæ white, the under one projecting. Halteres yellow. Wings greyish hyaline. Length 5–6 mm.

Two specimens. St. Vincent. With these two male specimens, there is a large number of female specimens of smaller size, in which the abdomen is black in ground-colour, with two pairs of dark-brown spots

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on the second and third segments. The front is broad, with a black stripe. The wings show a noticeable difference in that the posterior cross-vein is at right-angles to the fourth vein, and is a little shorter than the penultimate section of the fourth vein. In the males described above the anterior angle of the discal cell is distinctly less than a right angle, and the posterior cross-vein is longer than the penultimate section of the fourth vein. The epistoma is but little prominent in either sex.

3. *Limnophora* (*Spilogaster*?) *exul*, n. sp. (Pl. XII., figs. 122, head of ♂; 122*a*, wing.)

♂. Black. Eyes narrowly separated below the ocelli: median black stripe of the front expanded triangularly below; orbital margins silvery pollinose. Antennæ black; the third joint does not reach to the oral bristles; arista short plumose. Face light-grey pollinose. Proboscis and palpi slender, black. Mesonotum light yellowish-grey, opaque, with three broad, black stripes, the lateral ones widened back of the suture to the root of the wings. Scutellum black, its margins grey with four bristles, the apical cruciate pair approximated. Pleuræ light-grey pollinose, the upper part black. Abdomen elongate ovate; opaque light yellowish-grey; the first segment, except the posterior lateral margins and a pair of large triangles on the second and third segments, extending the whole length of each segment, and leaving a narrow stripe between them, black; fourth segment with three black or brown spots, the median one elongate. Legs black; pulvilli elongate; none of the tibiæ hairy. Wings lightly tinged; fourth vein sinuous near the extremity, narrowing the first posterior cell. Tegulæ white, the under one much larger than the upper one. Length 6–7 mm.

♀. Front less than one-third of the width of the head, with a broad black stripe. Abdomen broader and shorter, the deep-brown (not opaque black) markings more extensive, leaving a median stripe on the first three segments and the posterior angles of the first segment opaque grey.

Ten specimens. St. Vincent.

Cœnosia.

Meigen, Syst. Beschr. Europ. Dipt., v., 210, 1826.

1. *Cœnosia flavipes*, n. sp.

♂. Front densely light-grey pollinose, the ground-colour showing through bluish; in width about one-fourth that of the head.

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Face, cheeks and occiput of the same colour or lighter. Antennæ pure light yellow; arista bare, slender, yellow at its base. Thorax everywhere densely light-grey pollinose, but with a bluish tint as though from the black ground-colour; mesonotum with a median brown stripe. Abdomen yellow, the distal segments brownish or blackish; in shape elongate ovate and not flattened. Legs wholly yellow. Wings tinged with yellowish; penultimate section of the fourth vein not longer than the posterior cross-vein. Length 6 mm.

♀. Mesonotum with three brown stripes. Antennæ darker, the third joint in part brownish. Abdomen darker, the second and following segments each with a pair of small rounded spots, and a median brownish stripe. Hind tarsi brownish.

Numerous specimens. St. Vincent.

2. *Cœnosia insularis*, n. sp. (Pl. XII., figs. 123, head of ♂; 123*a*, wing.)

♂. Front opaque golden yellow, a little less than one-third of the width of the head, and of nearly equal width. Antennæ black; arista finely pubescent. Face yellowish-grey. Cheeks below the eyes rather narrower than the width of the third joint of the antennæ. Occiput swollen below; greyish pollinose, the orbits yellow. Mesonotum densely light grey pollinose, with two broad, dark coffee-brown stripes extending on the sides of the scutellum, the latter with a median, light coloured stripe, extending from the mesonotum. Pleuræ greyish pollinose. Abdomen cylindrical, only a little broader at the base; shining brownish-black with the anterior angles of the segments broadly grey pollinose; covered with recumbent hairs, and with a slender lateral bristle on each segment. Legs black; the knees and coxæ in front (beneath the pollen) yellowish. Wings tinged with pale-brown. Tegulæ nearly white, the under one projecting beyond the upper. Halteres yellow. Palpi black. Length 6–7 mm.

Numerous specimens. St. Vincent. The abdomen in the female is elliptical.

MICROPEZIDÆ.

Tanypeza.

Fallen, Dipt. Suec. Opomyz., 4, 1820.

1. *Tanypeza claripennis*. (Pl. XII., figs. 124, head of ♂; 124*a*, wing.)

Tanypeza claripennis, Schiner, Reise der Novara, Dipt., 247.—Brazil.

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A single specimen without abdomen and hind legs, but which, otherwise, agrees so well with the description of this species that I believe the determination is sufficiently certain.

CALOBATA.

Meigen, Illiger's Mag., 1803; *Ceyx*, Dumeril, 1801.

1. *Calobata angulata.*

Calobata angulata, Loew, Centur., vii., 87; Schiner, Reise der Novara, Dipt., 253, Brazil, Colombia (Schiner, Loew).

In the present collection there are about twenty specimens which were thought at first sight to be conspecific. A more careful examination, however, disclosed trustworthy specific differences. Both of the species are evidently closely allied to *C. lasciva*, Fabr., and it is not improbable that they have been confounded with that species. I do not know *C. lasciva*, but they differ, according to Schiner, in the light-coloured bands of the hind femora being oblique. Schiner thought that *C. angulata* might be identical with *C. annulata*, F., but, if my determinations are correct, he was in error. In the present species the front is very narrow and long, distinctly less than one-third of the width of the head. The front tarsi are white from near the middle of the metatarsi, the terminal joints scarcely perceptibly darker. The lighter-coloured portions of the wing are subhyaline, and the first posterior cell is narrowly open The head is reddish-yellow with a small dark-red or black spot in the middle of the front. The antennæ in all our specimens are more reddish than black. I have compared specimens from Brazil in my collection, and find no differences.

2. *Calobata annulata.*

Musca annulata, Fabricius, Syst., iv., 338; Syst. Antl., 262.

Calobata annulata, Wiedemann, Auss. Zw. Ins., ii., 534.—Cayenne.

Grallopoda annulata, Rondani, Esapoda Ditteri, 178.—Ins. St. Sebastian.

The species which I identify as this from both St. Vincent and Brazil, has a dark reddish-brown head, with

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a broad front, distinctly more than one-third of the width of the head, brownish-red antennæ, a rather narrow clypeus, stouter and rather longer front tarsi, with only the second, third, and fourth joints light-yellow, the lighter coloured parts of the wing more pure hyaline, and the first posterior cell closed.

The genus *Calobata* has been repeatedly subdivided by Macquart and Rondani, but their subdivisions have not been accepted by later writers. For *C. lasciva* (*C. albimana*, Macq.) Macquart proposed the genus *Tæniaptera*, but afterward withdrew it. For the same species Rondani proposed *Grallopoda*. For the species with open first posterior cell, bare arista and long anal cell, he proposed *Mimegralla*; for those with closed first posterior cell, bare arista and long anal cell, *Grallomyia*; while *Raineria*, which was afterwards changed to *Tanipoda*, was applied to species differing from *Grallomyia* in the short anal cell. *Calobata* he restricted to those species with plumose antennal arista.

3. *Calobata mellea*, n. sp. (Pl. XII., fig. 125, wing.)

♂, ♀. Reddish yellow; abdomen black. Sides of the front shining; in the middle a dark-red opaque stripe. Antennæ yellow, third joint not twice as long as wide; arista short-plumose. Face yellow, silvery pollinose on the sides. Clypeus of moderate width, red or black, shining. Thorax reddish-yellow, shining, the pleuræ a little lighter coloured. Abdomen black, shining, slender; male organs and the ovipositor, except its base, yellow. Legs yellow; front tibiæ except the extreme tip black; middle and hind tibiæ, middle tarsi, and the hind tarsi, except the greater portion of the metatarsi brownish; front metatarsi light-yellow; hind metatarsi yellow. Wings hyaline, with a large brown spot filling out the first posterior cell to beyond its middle, the outer half of the discal cell, and triangularly in the submarginal cell to near the tip of the second vein; first posterior cell narrowly open; anal cell not produced. Length 6–8 mm.

Nine specimens. St. Vincent.

Nerius.

Fabricius, Syst. Antl., 1805.

1. *Nerius bistriatus*, n. sp. (Pl. XII., figs. 126, head of ♀; 126*a*, wing.)

♀. Front narrowly opaque yellow on the sides, in the middle with a broad opaque black stripe, broader in front, where it is red-

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dish. Basal joints of the antennæ blackish; third joint brownish-red; arista slender, black. Face yellow, somewhat blackish in the depression; the sides above, running obliquely to the root of the antennæ, shining black. The yellow of the face continues back horizontally at the lower margin of the eye; the occiput is black, except a yellow spot back of the middle of each eye. Mesonotum opaque black, with two light, greyish-yellowish, pollinose stripes. Scutellum opaque black, with a broad yellow stripe in the middle. Pleuræ opaque black, more or less yellowish-dusted; along the dorsopleural suture a yellow stripe, as though continuous with the yellow spot of the sides of the occiput; lower portion of the pleuræ in front yellow; a rounded process in front of the halteres yellow. Abdomen black, not at all shining; ovipositor cylindrical, yellowish. Coxæ and legs yellow, the tarsi somewhat infuscated; front femora for the whole length below, and the four posterior femora distally, spinose. Wings strongly tinged with brownish-yellowish; first posterior cell open. Length 6 mm,

One specimen. St. Vincent.

ORTALIDÆ.

Euxesta.

Loew, Berl. Ent. Zeit., v., 385, 1867.

1. *Euxesta stigmatias.* (Pl. XII., fig. 127, wing.)

Euxesta stigmatias, Loew, Berl. Ent. Zeit., xi., 310, pl. ii., fig. 18; Monogr., iii., 163, pl. ix., fig. 17.—Cuba, Brazil.

Numerous specimens agreeing with the description. The hind metatarsi are, for the most part, yellow.

2. *Euxesta annonæ.*

Musca annonæ, Fabricius, Ent. Syst., iv., 358.
Tephritis annonæ, Fabricius, Syst. Antl., 320.
Ortalis annonæ, Wiedemann, Auss. Zweifl. Ins., ii., 463.—South America.
Urophora quadrivittata, Macquart, Hist. Nat. Dipt., ii., 456.
Euxesta annonæ, Loew, Berl. Ent. Zeitschr., xi., 305, pl. ii., fig. 13; Monogr., iii., 162, pl. ix., fig. 13.—Cuba.
Amethysa annonæ, Schiner, Reise der Novara, Diptera, 283.—South America.

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A single specimen which agrees with the description in everything save some of the wing-markings. The brown bands of the wings have blackish clouds continuing them to the hind margin, and there is a distinct hyaline interval in front of the second vein between the third and fourth bands.

3. *Euxesta*, n. sp.

A single specimen of a small species differs from all known to me of those having four bands, in the possession of a rounded hyaline spot in front of the second vein and beyond the third band. The purely hyaline interval is situated beyond this spot, and is narrow; the apical band is narrow, and the brown of the broad second band scarcely exceeds the third vein, but is filled out to the hind margin by a strong blackish cloud. The species is small, the front is brownish-red, the antennæ, front coxæ and metatarsi are yellowish. It is labelled "Southern end of the island. Open ground near sea, on herbage. May."

4. *Euxesta apicalis*, n. sp. (Pl. XII., fig. 128, wing.)

♂, ♀. Allied to *E. notata*, but the costal cell wholly brown. Steel-blue or green-blue, but little shining, the abdomen with blackish reflections. Front dark-red or reddish-brown, the orbits narrowly whitish; the vertex and the upper part of the orbits, blue; hair black. Antennæ brownish-yellow, the third joint oval. Face considerably excavated, and, together with the clypeus, steel-blue, shining, the upper part pollinose; cheeks reddish. An arcuate band extending across the middle of the mesonotum has a more blackish reflection. Coxæ and femora light yellow; front tibiæ and tarsi black; the four posterior tibiæ and the distal joints of their tarsi brown, their basal joints yellow or yellowish. Wings hyaline; the costal and subcostal cells throughout, a small spot in the extreme proximal end of the submarginal cell, and a small spot beginning at the extreme tip of the marginal and extending across the submarginal into the first basal cell, uniformly dark brown; fourth vein distinctly curved forward, narrowing the first posterior cell; the fifth vein reaches the margin of the wing; first section of the ovipositor a little longer than wide, distinctly longer than the last abdominal segment, yellowish at the base; abdomen for the most part black. Length 4–4½ mm.

Six specimens. St. Vincent.

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Epiplatea.

Loew, Berl. Ent. Zeit., 1867, 324.

1. *Epiplatea amabilis*, n. sp.

♀. Front moderately broad, slightly narrower above, opaque yellowish-red, with short black hairs. Face shining translucent reddish-yellow; gently excavated under each antenna; nearly vertical and straight in profile. Frontal, facial and occipital orbits narrowly silvery-white. The clypeus forms a narrow, horse-shoe shaped body, not projecting in profile. Antennæ reddish-yellow; third joint elongate oval, not reaching quite to the lower margin of the face; arista black, bare. Proboscis stout; palpi slender, yellowish, except at the base. Mesonotum uniformly yellowish-red (about the same colour as the front); scutellum somewhat brownish, with four bristles. Pleuræ shining, more brownish, in the middle below brown. The short hair of the mesonotum and the bristles are black. Abdomen wholly deep shining black, with short black hair; ovipositor but little longer than the last abdominal segment, black. Legs deep brown, the knees and tarsi more yellowish; middle tibiæ with a stout spur; front femora with some bristles below. Wings nearly hyaline; the costal and subcostal cells, reaching back through the beginning of the submarginal cell to the fourth vein, a band beginning at the outer part of the first vein and reaching over the anterior cross-vein, an elongate spot of about the same width covering the posterior cross-vein, and the apex of the wing, save a rounded interval at the very tip, brown; third and fourth veins somewhat convergent at the tip; anal cell rounded distally, not at all drawn out into a point. Length 4½–5 mm.

This species, it will be seen, does not agree in all its details with the characters given by Loew for the genus, but the discrepancies are trivial. In some specimens the brown spots of the wings are narrower, and that at the tip might be called an incomplete band. Four specimens.

TRYPETIDÆ.

Trypeta.

Meigen, Illiger's Mag., ii., 1803.

1. *Trypeta (Aciura) phœnicura*.

Trypeta phœnicura, Loew, Monogr., [illegible]9, pl. vi., fig. 12.—Brazil.

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Four specimens, agreeing closely with Loew's description.

2. *Trypeta* (*Tephritis*) *fucata*. (Pl. XII., fig. 129, wing.)

Musca fucata, Fabricius, Ent. Syst., iv., 359.—West Indies.
Tephritis fucata, Fabricius, Syst. Antl., 321.
Trypeta fucata, Wiedemann, Auss. Zweifl. Ins., ii., 505.—South America.
Trypeta (*Tephritis*) *fucata*, Loew, Monogr., iii., 300.—Buenos Aires.

A female specimen agreeing well with Loew's description, which was drawn from one of Wiedemann's types.

3. *Trypeta* (*Ensina*) *peregrina*. (Pl. XIII., fig. 130, wing.)

Trypeta (*Ensina*) *peregrina*, Loew, Monogr., iii., 292, pl. x., fig. 30.—Brazil.

Two specimens, one of which is labelled "Leeward, near sea. By open stream. Sept."

4. *Trypeta* (*Evaresta*) *melanogastra*. (Pl. XIII., fig. 131, wing.)

Trypeta melanogastra, Loew, Monogr., i., 90, pl. ii., fig. 24; iii., 315, pl. x., fig. 24.—Cuba.

Five specimens. In several of the specimens the base of the abdomen is yellow; in all the metanotum is not shining, but pollinose.

5. *Trypeta* (*Urellia*) *solaris*. (Pl. XIII., fig. 132, wing.)

Trypeta (*Urellia*) *solaris*, Loew, Monogr., i., 84, pl. ii., fig. 19; iii., 325, pl. x., fig. 19.—United States.

Two specimens, which agree closely with the description and figures of this species. With them, however, are others which seem less certainly identical. They are smaller, and have in the wings a ninth ray, as is described for *U. polyclona*. The latter, however, is described as having four scutellar bristles.

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6. *Trypeta* (*Plagiotoma*) *incompleta*, n. sp.

♂, ♀. Yellow, the mesonotum with two, the abdomen with eight black spots. Front rather narrow, especially below; on each side with three or four brownish bristles, and with two proclinate ocellar bristles. Antennæ light-yellow; arista bare, black on the distal half. Face vertical, the oral margin projecting a little. Proboscis short; palpi projecting slightly in front of the oral margin. Mesonotum light ochraceous yellow, with short yellow hairs and brownish bristles; just above and behind the root of the wing on each side, there is a small round black spot; scutellum with four bristles. Abdomen a little more reddish, with yellow hairs; on each side with four rounded black spots. Ovipositor yellow, as long or a little longer than the last two abdominal segments (in one specimen it is drawn out longer than the abdomen). Legs yellow. Wings very similar to those of *P. obliqua*, Say, except that the first oblique band back of the tip of the wing is represented only by the blackish spot at the tip of the fourth vein and a slight yellowish tinge in front of it. Length 3½–4 mm.

This species is closely allied to *P. obliqua*, Say, but differs in both sexes in the absence of the pleural spots (there is a blackish spot at the root of the halteres, and a small pair on the underside of the scutellum), and in the wing-markings.

SAPROMYZIDÆ.

Lonchæa.

Fallen, Ortalidæ, 1820.

1. *Lonchæa longicornis*, n. sp.

♂. Front narrow, with nearly parallel sides, about three times as long as wide; shining black. Antennæ brownish-black; third joint elongate, reaching to beyond the oral margin; arista bare. Eyes bare. Thorax and abdomen wholly deep shining black. Tegulæ white ciliate. Legs brownish-black, all the metatarsi light-yellow. Wings lightly tinged with brownish-yellowish. Length 4 mm.

One specimen. St. Vincent.

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2. *Lonchæa brevicornis*, n. sp.

♀. Front and face shining greenish-black; front about twice as long as wide. Antennæ black, the third joint oval, not twice as long as wide; arista bare. Eyes bare. Thorax and abdomen deep metallic-green; ovipositor black. Legs brownish-black, the first two joints of all the tarsi light-yellow. Wings greyish hyaline. Length 4 mm.

One specimen. St. Vincent.

PHYSOGENUA.

Macquart, Dipt. Exot. Suppl., iii., 60, 1851; *Eupteromyia*, Bigot. Rev. et Mag. Zool., 309, 1859.

1. *Physogenua nigra*, n. sp. (Pl. XIII., fig. 133, head of ♂.)

♂, ♀. Deep shining black throughout, the third joint of the antennæ and the four posterior tarsi reddish-yellow. Face large, bare, smooth, evenly convex from side to side and from the antennæ to near the oral margin; just above the oral margin a narrow horizontal groove; the narrow orbits silvery; clypeus slightly prominent; the face on either side with three or four small bristles. Palpi slender, black. Third joint of the antennæ twice as long as wide; arista black, plumose. Scutellum convex, subtriangular, with four bristles. Halteres white. Abdomen short-oval. Wings tinged with brownish-yellow; first posterior cell a little narrowed at the extremity; anterior cross-vein nearly opposite the tip of the first vein. Length 4½ mm.

Six specimens. St. Vincent. From the two described species, *P. vittata*, Macq. (*Lauxania variegata*, Loew), and *P. ferruginea*, Sch., the present is easily distinguished by its black colour.

SAPROMYZA.

Fallen, Dipt. Suec. Ortalid., 29, 1820.

1. Arista plumose 2
   Arista pubescent or bare 7
2. Mesonotum striped 3
   Mesonotum unicolorous; wings without dark markings . 5
3. Pleuræ with stripes; face with a small black spot in the middle below 4
   Pleuræ unicolorous . . . . . *puella*, n. sp.

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4. Wings with markings . . . . . *octovittata*, n. sp.
   Wings unicolorous . . . . . *macula*, Loew.
5. Shining black species . . . . . (*Lauxania*), sp.
   Not shining black 6
6. Third joint of the antennæ yellow . . . . . *sordida*, Med.
   Third joint in large part black . . . . . *vulgaris*, Fitch.
7. Mesonotum vittate 8
   Mesonotum not vittate 11
8. Wings for the most part dark-brown . . *angustipennis*, n. sp.
   Wings nearly hyaline 9
9. Mesonotum with four slender brown stripes; third joint of the antennæ reddish-yellow . . . . . *lineata*, n. sp.
   Mesonotum with broad stripes; third joint of antennæ black 10
10. Mesonotum with broad ashy-grey and brown stripes *exul*, n. sp.
    Mesonotum with yellow and brown stripes . . *venusta*, n. sp.
11. Scutellum with two black spots on the margin *ingrata*, n. sp.
    Scutellum without spots . . . . . *sororia* n. sp.

1. *Sapromyza macula.*

Sapromyza macula, Loew, Centur., x., 82.—Texas.

♂, ♀. Front opaque-yellow, with a median brown stripe; ocelli with small proclinate bristles. Antennæ yellow, third joint twice as long as wide; arista short-plumose. Face and cheeks light-yellow, the former with a round black spot above the oral margin in front, the latter with a small brown spot. Thorax ochraceous yellow, the mesonotum with four dark-brown stripes, the median pair extending on the scutellum. Pleuræ with two brown stripes, the upper one below the base of the wings; the lower, shorter, one across the base of the middle coxæ. Abdomen yellow or luteous yellow, with three rows of black spots, the lateral ones more or less elongate and sometimes coalescent. Legs light-yellow, the tibiæ with a proximal, more or less indistinct (especially on the front pairs), narrow brown ring. Wings tinged with yellowish; penultimate section of the fourth vein one-half the length of the ultimate section. Length 5–5½ mm.

Numerous specimens from St. Vincent and Chapada, Brazil. I have no North American specimens for comparison, but the description applies so well that I think the identification is probable. The West Indian specimens are lighter yellow, and the thoracic stripes are darker and are continued on the scutellum. Those from

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Brazil agree more closely with Loew's description. In the West Indian specimens there is also a distinct frontal stripe, only slightly indicated in the South American ones.

2. *Sapromyza angustipennis*, n. sp. (Pl. XIII., fig. 134, wing.)

♂, ♀. Front broader above than below, its width at the anterior end equal to about one-half the length; opaque reddish-brown with yellowish spots; on either side with four small yellow tubercles, from the upper three of which the stout frontal bristles arise. Antennæ brownish-yellow; third joint a little longer than wide. Face thickly greyish-pollinose, with two small, oval black spots. Cheeks, proboscis, palpi, and the greater part of the occiput light-yellow. Mesonotum and scutellum opaque reddish-brown, the former with the beginning of stripes and two or three minute spots on each side in front grey. Pleuræ more yellowish-brown. Abdomen long ovate; first three segments light-yellow; the next three yellow with a narrow median stripe and an ill-defined spot, each side black. Legs light-yellow; hind tibiæ with a stout preapical bristle. Wings elongate, deep brown in front, nearly hyaline on the posterior part; in the outer part there are two or three small round hyaline spots, near which the brown is of a deeper colour. Length 3½–4 mm.

Six specimens. This species, in its front and elongated wings, is somewhat aberrant from most *Sapromyzæ*.

3. *Sapromyza puella*, n. sp.

♂, ♀. Front only a little longer than wide; reddish-yellow, brownish above and on the sides. Antennæ black, the first two joints somewhat reddish; third joint oval, more than twice as long as wide; arista plumose on the upper side of the proximal part. Face, cheeks and lower part of the occiput light-yellow. Thorax deep-brown or black, almost opaque, with two narrow greyish stripes. Scutellum black. Abdomen black, the terminal segments more or less reddish. Legs light-yellow, the tarsi brownish; hind tibiæ without a preapical bristle. Wings yellowish; ultimate section of the fourth vein rather more than twice the length of the penultimate section. Length 2½–3 mm.

Twenty specimens. St. Vincent.

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4. *Sapromyza exul*, n. sp.

♂, ♀. Front about twice as long as wide, opaque yellowish-grey, with an opaque dark-brown median stripe, slightly narrowed anteriorly. Antennæ brownish-yellow, third joint in part blackish, rather narrow, about three times as long as wide; arista pubescent. Face black in ground-colour, thickly silvery grey-pollinose. Occiput black, the narrow lateral orbits grey. Mesonotum densely yellowish grey-pollinose, with three broad, dark coffee-brown stripes, the middle stripe about equal in width to the adjacent light-coloured stripes. Scutellum with the yellowish-grey stripes of the mesonotum continued and uniting at the tip, leaving the middle as the continuation of the middle brown stripe. Pleuræ for the most part shining black, somewhat thinly pruinose above. Abdomen shining black, thinly greyish-pollinose in an oblique light. Legs deep-brown, the femora more black, the base of the tibiæ, the four posterior tarsi and the front metatarsi yellow; hind tibiæ with a well-developed preapical bristle. Wings light brownish-yellowish; penultimate second of the fourth vein more than one-half of the length of the ultimate section. Length 4–4½ mm.

Eight specimens. St. Vincent.

5. *Sapromyza octovittata*, n. sp.

♂, ♀. Front opaque yellow, rather longer than wide, with a median brown stripe, on either side of which there are three stout bristles; ocelli with small proclinate bristles. Antennæ yellow, the third joint twice as long as wide; arista short plumose. Face and cheeks light-yellow, the former with a rounded black spot above the oral margin in front. Thorax light opaque yellow, the mesonotum with light-brown stripes, the median pair extending on the sides of the scutellum. Pleuræ with two brown stripes, the one below the base of the wings, the other across the base of the middle coxæ. Abdomen yellow or brownish-yellow, with three rows of small, dark-brown spots, forming three interrupted stripes; the spots are sometimes obscure, perhaps as the result of desiccation. Legs light-yellow, the four posterior tibiæ with a proximal narrow brown ring. Wings clouded with dark-brown along the costa to the tip, on the cross-veins and on the base and outer part of the fourth vein; penultimate section of the fourth vein not one-half the length of the ultimate section. Length 4–5 mm.

This species has its markings, aside from those of the wings, very much as they are in *S. macula*.

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6. *Sapromyza* (*Lauxania* ?), sp.

♂. Shining black. Front with two bristles on each side below the vertical ones; ocelli with small proclinate bristles. Face rather flat, wholly opaque light grey; a transverse groove above the oral margin. Antennæ black, third joint oval, fully twice as long as wide; arista moderately long plumose on the upper side, pubescent on the under side. Thorax and scutellum wholly shining, without stripes or spots. Abdomen shining brownish-black. Legs black or brownish-black, the four posterior tibiæ and tarsi more or less yellow. Wings hyaline, the penultimate section of the fourth vein about one-half the length of the ultimate section. Length 5 mm.

One specimen. St. Vincent. This species is allied to *S. longipennis*, but is distinct in the more shining colour and in the distinctly narrower front, which is perceptibly longer than wide. Possibly it is identical with *Lauxania muscaria*, Loew (Centur., i., 87; Schiner, Reise der Novara, Dipt., 282), but the face is not shining. As the shining black colour is the final difference between *Sapromyza* and *Lauxania*, this species would properly come under the latter. The difference from *S. longipennis* is, however, very slight.

7. *Sapromyza sordida*, n. sp.

? *Sapromyza sordida*, Wiedmann, Auss. Zw. Ins., ii., 456.—West Indies.

♂, ♀. Head and antennæ yellow. Front as broad as long shining; ocellæ bristles wanting or rudimentary. Third joint of the antennæ twice as long as wide; arista black, long plumose on the upper side. Face rather flat, lightly silvery-pollinose. Mesonotum shining reddish-yellow, the pleuræ a little more yellowish. Abdomen yellowish-brown, moderately shining. Legs yellow. Wings lightly tinged with yellowish; penultimate section of the fourth vein more than half the length of the ultimate section. Scutellum unicolorous, large, with four strong bristles. Palpi wholly yellow. Length 5 mm.

Twenty-four specimens.

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8. *Sapromyza vulgaris.*

Chlorops vulgaris, Fitch, Reports, vol. i., 300, pl. i., fig. 4.

Sapromyza plumata, Van der Wulp, Tijdschr., v., Entom. (2), 159.—Atlantic States.

Sapromyza ocellaris, Townsend, Can. Entom., 1893, 303; F. Lynch, A., An. Soc. Cient. Arg., xxxiv., 283, 1893.—New Mexico.

♂, ♀. Front reddish-yellow, broad, a minute spot at the ocelli; ocelli with two well-developed ocellar bristles. Antennæ yellow, the third joint black at the tip, and along the under side, more than twice as long as wide; arista plumose on the upper side. Face and cheeks light-yellow. Thorax shining; mesonotum reddish-yellow, the pleuræ more yellowish. Scutellum large, with four bristles on its margin. Abdomen yellow, brownish-yellow or brown; in some specimens reddish-yellow with a narrow, but distinct, brown band on the posterior part of each segment. Legs smoky hyaline; penultimate section of the fourth vein not more than one-half the length of the ultimate section. Palpi black at tip. Length 4–5 mm.

Numerous specimens. St. Vincent. *S. cincta*, Loew, from Cuba and Porto Rico (Roeder), must be very closely allied, probably identical with this species.

9. *Sapromyza venusta*, n. sp.

♂, ♀. Front rather narrow, nearly twice as long as wide, opaque brownish-yellow, with three pairs of recurved bristles. First two joints of the antennæ yellow; third joint black, oval, about twice as long as wide; arista black, short pubescent. Face and cheeks light-yellow; palpi for the most part black. Thorax shining yellow, with three broad, brown or brownish stripes, the middle one obsoletely geminate. Abdomen brown, at the base yellow. Legs yellow. Wings smoky hyaline; penultimate section of the fourth vein but little more than one-third of the length of the ultimate section. Length 4 mm.

Six specimens. In some of the specimens, the abdomen has a median series of black spots, with the sides of the segments blackish. Like most specimens in this genus the abdomen has seemed to suffer in its coloration in drying, and fresh specimens are needed to determine the markings with clearness.

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10. *Sapromyza lineata*, n. sp.

♂. Shining yellow. Front as long as broad. Third joint of the antennæ a little brownish at the tip, twice as long as broad; arista black, long pubescent. Mesonotum somewhat reddish-yellow, with four slender brown stripes. Abdomen in the dried specimens light brownish-yellow, immaculate. Legs light-yellow; the distal joints of the front tarsi brown. Wings yellowish hyaline; penultimate section of the fourth vein not more than one-half the length of the ultimate section. Length 4 mm.

Four specimens. St. Vincent. The colour in some of the specimens is light reddish-yellow throughout. The terminal joints of all the tarsi are somewhat brownish. The palpi are wholly yellow.

11. *Sapromyza sororia*, n. sp.

♂, ♀. Front yellow or brownish-yellow, narrow, less than one-third the width of the head, with the usual three pairs of bristles and a small proclinate ocellar pair. Face and antennæ yellow, the third joint of the latter oval, its length only a little greater than its width. Palpi black at the tip. Mesonotum reddish or brownish-yellow, pleuræ more yellow, both shining but little. Abdomen yellow or brownish-yellow, with a median row of rounded black spots. Wings greyish hyaline; the penultimate section of the fourth vein but little more than one-third the length of the ultimate section. Length 4–5 mm.

Numerous specimens. St. Vincent. In some specimens the abdomen is brown or black, probably due to the effects of drying; allied to *S. rotundicornis*, Loew.

12. *Sapromyza ingrata*, n. sp.

♂, ♀. Front rather narrow, yellow, or brownish-yellow, but little shining. Antennæ reddish-yellow; third joint oval, not twice as long as wide; arista black, short-pubescent. Face and cheeks yellow, opaque, the former with a minute spot near the oral margin in front. Mesonotum reddish-yellow, with short black bristly hairs; the two median rows of bristles do not extend in front of the middle. Scutellum yellow, with a round, deep black spot on each side between the origin of the bristles. Pleuræ yellow. Abdomen yellow or brown, apparently in life with series of median and lateral black spots. Legs yellow. Wings smoky hyaline; veins black; penultimate section of the fourth vein rather less than half of the length of the ultimate section. Length 5 mm.

Numerous specimens. St. Vincent. I was at first

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inclined to identify this species with *S. grata* from Brazil, but the brief description shows such discrepancies that it is hardly possible that the species are identical. Possibly it is *S. octopuncta*.

HETERONEURIDÆ.

Heteroneura.

Fallen, Agromyzidæ, 1823.

1. Thorax black 2
   Thorax in large part yellow 3
2. Tip of antennæ black . . . . . *flavipes*, n. sp.
   Antennæ wholly yellow . . . . . *concinna*, n. sp.
3. Wings cinereous hyaline 4
   Wings in large part brown 5
4. Mesonotum wholly yellow in front . . . . . *lumbalis*, n. sp.
   Mesonotum black on the sides in front . . . . *valida*, n. sp.
5. Mesonotum and scutellum black . . . . . *pleuralis*, n. sp.
   Mesonotum and scutellum in large part yellow *xanthops*, n. sp.

1. *Heteroneura xanthops*, n. sp.

♂, ♀. Head, including the proboscis, wholly yellow; front and face of equal width, the former widened near the vertex only; arista black, long pubescent or short-plumose. Mesonotum shining black on the sides, a broad stripe, about one-third of the whole length, beginning at the neck and running to the tip of the scutellum, light-yellow, the sides of the scutellum brown or brownish. Pleuræ, pectus, and coxæ pure light-yellow, lighter than the yellow of the mesonotum. Abdomen black or dark-brown, the basal segments yellowish, the thickened under portion of the hypopygium yellow. Legs yellow, the tarsi slightly brownish; middle tibiæ with a stout spur and a preapical bristle. Wings clouded with brown on the distal half, less strongly so on the proximal portion; penultimate section of the fourth vein one-fourth or one-fifth the length of the ultimate section, and shorter than the last section of the fifth vein. Length 3–3½ mm.

Five specimens. St. Vincent. A single female specimen has the mesonotum black, except an elongate yellow triangle reaching nearly to the scutellum, the metanotum black, and the abdomen black. Several males have the black of the mesonotum beginning further back, and the whole hypopygium yellow. It is not improbable that there are two distinct species here.

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2. *Heteroneura flavipes*, n. sp. (Pl. XIII., fig. 135, wing.)

♂, ♀. Front gently convex on the sides, the eyes most approximated immediately below the antennæ, and then immediately receding, Front brown, below red, the narrow orbits more yellowish. Antennæ yellow, the third joint brown or blackish at the tip; arista black, finely pubescent. Face, cheeks, and lower portion of the occiput light-yellow. Thorax black, but little shining, the pleuræ somewhat pitchy-black; mesonotum covered with light-coloured pubescence. Abdomen black, with black hairs. Halteres nearly white. Legs pure light-yellow; middle femora with a row of short bristles below; middle tibiæ with a strong spur; all the tibiæ without distinct preapical bristle. Wings brown, at the immediate base hyaline, and across the middle subhyaline; penultimate section of the fourth vein but little longer than the posterior cross-vein. Length 3 mm.

Six specimens. St. Vincent. The front is comparatively narrow, distinctly less than one-third of the width of the head.

3. *Heteroneura concinna*, n. sp.

♂, ♀. Very much like *H. flavipes*, from which it differs in the antennæ being wholly light-yellow, in the wings being nearly uniformly blackish, except the immediate base, and especially in the presence of distinct preapical bristles on the middle and hind tibiæ. It is also a little smaller.

Four specimens. St. Vincent.

4. *Heteroneura pleuralis*, n. sp.

♂. Head, including the antennæ and proboscis, wholly light-yellow, except a minute spot near the vertex, and the upper part of the occiput. Arista black, yellow at the base, very finely pubescent. Mesonotum shining brownish-black, the fine pubescence in an oblique light appearing yellow; pleuræ light-yellow with a spot of the same colour as the dorsum reaching down in front of the wings; metanotum dark-brown. Abdomen opaque black, with black hair, the immediate base yellow. Legs light-yellow; hind and middle tibiæ with a distinct preapical bristle. Wings smoky hyaline; the distal third, as far as the fourth vein, and a spot covering the cross-veins brown; penultimate section of the fourth vein about one-third of the length of the ultimate section of the fifth vein, and only a little longer than the posterior cross-vein. Length 2½ mm.

One specimen. St. Vincent.

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5. *Heteroneura valida*, n. sp. (Pl. XIII., fig. 136, wing.)

♂, ♀. Head, including the antennæ, proboscis, and occiput, light-yellow. Arista black, pubescent. Thorax light-yellow, mesonotum on the sides and behind, and the scutellum, brown or black, shining; the yellow extends as a broad stripe to or beyond the suture. Abdomen black or dark-brown, its base, the ovipositor, and the hypopygium yellow. Legs yellow; middle tibiæ with a stout spur and a preapical bristle. Wings cinereous hyaline; penultimate section of the fourth vein as long as the last section of the fifth vein. Length 2½ mm.

Numerous specimens. St. Vincent.

6. *Heteroneura lumbalis*, n. sp.

♂, ♀. Differs from *H. valida* in the mesonotum being wholly yellow before the middle, the scutellum and posterior part wholly black. The arista is distinctly longer pubescent, almost short plumose. The wings are a little more darkly tinged. Length 2½ mm.

Numerous specimens. St. Vincent.

TRIGONOMETOPUS.

Macquart, Hist. Nat. Dipt., ii., 419, 1835.

1. *Trigonometopus rotundicornis*, n. sp. (Pl. XIII., fig. 137, head of ♂.)

♂. Head triangular, the face very much receding; front plane, horizontal, with three pairs of bristles reaching two-thirds of the distance to the root of the antennæ. Eyes longitudinally oval. Antennæ porrect, the first two joints short, the third rounded, not longer than broad. Face on either side with a slender groove, running from the root of the antennæ to the back part of the cheek. Proboscis with large labella; palpi slender. Thorax elongate; mesonotum flattened, with bristles in the middle nearly to the anterior margin; scutellum flattened, semi-oval, with four bristles. Abdomen oval, depressed, composed of six segments. Legs rather stout; front femora with a row of bristles below; hind tibiæ with a preapical bristle. Auxiliary and basal cells distinct. Arista bare. Sides of the cheeks with a row of long bristles. Yellow, opaque. Front a little darker coloured, with black hair. Antennæ reddish-yellow. Face light-yellow. Sides of the frontal projection somewhat brownish Mesonotum ferruginous, darker

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towards the sides, and forming a sharply-limited brown stripe on the dorso pleural suture; in the middle a more or less feebly indicated slender light-coloured line extending on the scutellum. Abdomen in large part brown, perhaps of post-mortem origin. Legs light yellow. Wings cinereous hyaline, the narrow costal margin, extending to the tip of the fourth vein, brown; on the cross-veins slight indications of clouds. Posterior cross-vein less than its own length on the fifth vein from the margin of the wing. Length 4½ mm.

Two specimens. This species will be best distinguished from *T. vittatus* by the brown costal margin of the wings.

EPHYDRIDÆ.

NOTIPHILA.

Fallen, Hydromyzidæ, 1823.

Mesonotum not vittate; abdomen coffee-brown and grey, opaque.
- Mesonotum with numerous small brown dots; grey spots of the abdomen irregular . . . . . *bellula*, n. sp.
- Mesonotum not with numerous small brown dots; grey spots of the abdomen regular . . . . *decorata*, n. sp.

1. *Notiphila decorata*, n. sp.

♂, ♀. Front opaque grey, the triangle and the narrow orbits a little lighter coloured. Antennæ black, the third joint at the base somewhat yellowish. Face, cheeks, and occiput densely light-grey, opaque. Palpi brownish. Mesonotum and scutellum densely light-grey, opaque; the bristles of the mesonotum and scutellum arise from small black spots, but the hair is shorter than in *N. bellula* and does not arise from small brown dots. Abdomen opaque dark coffee-brown, with a narrow, complete, median stripe, and interrupted posterior bands to the second and following segments nearly white, opaque; the spots are separated in all save the last segment from the median stripe by a narrow brown space. Femora, except the immediate tip, the tibiæ in large part, and the terminal joints of the tarsi, black; the legs elsewhere yellow. Wings brownish-hyaline. Length 4 mm.

Two specimens. St. Vincent.

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2. *Notiphila bellula*, n. sp.

♂, ♀. Front opaque brownish, the large vertical triangle more yellowish-grey, the narrow orbits grey. Antennæ red, the upper border of the second and third joints brown or blackish. Face, cheeks, and occiput, for the greater part, densely grey-pollinose. Palpi light-yellow. Mesonotum densely brownish grey-pollinose, with numerous small rounded points where the bristles and hairs arise; scutellum like the mesonotum. Pleuræ and metanotum densely grey-pollinose; a small brown spot on the upper part of the mesopleuræ. Abdomen light coffee-brown; the first segment and a narrow median stripe, and irregular spots on the sides of the other segments posteriorly opaque grey; the median stripe is narrow and of equal width throughout. Femora black, with the tip yellow; front tibiæ, except the base and immediate tip, and the front tarsi black; middle and posterior tibiæ and tarsi yellow, the tibiæ more or less brownish in the middle, the tarsi blackish at the tip. Wings nearly uniformly tinged with brownish-yellowish. Length 4 mm.

Ten specimens. St. Vincent. A closely allied species in the writer's collection, from San Domingo, differs in the presence of distinct stripes on the mesonotum. In some specimens the irregular grey spots of the abdomen, nearly subdivide the brown into four series of spots or stripes.

Paralimna.

Loew, Monogr., i., 138, 1862.

Mesonotum with numerous small brown spots; abdomen conspicuously banded . . . . . *multipunctata*, n. sp.

Mesonotum not spotted; bands of the abdomen inconspicuous *obscura*, n. sp.

1. *Paralimna multipunctata*, n. sp.

? ? *Paralimna secunda*, Schiner, Reise der Novara, Dipt., 241.—South America.

♂, ♀. Face and cheeks densely greyish white-pollinose, with a slight shade of yellowish. Clypeus very prominent, of the same colour as the face; palpi slender, brown. Antennæ black, the third joint in an oblique light with a whitish reflection, the pile on its upper side long. Front opaque brown; anteriorly with minute

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blackish dots and of a more greyish colour; on the upper side, near the eyes, with an elongated, more blackish triangle. Mesonotum and scutellum greyish-yellowish, with numerous, in part coalescent, small, dark-brown dots, giving the mesonotum a brown appearance; in the middle may be distinguished two entire, narrow, brown stripes. Pleuræ and metanotum densely light-grey, without the dots of the mesonotum. Abdomen opaque, light yellowish-grey; second segment with a small, semi-oval, coffee-brown spot on each side anteriorly, and in the middle a slender incomplete stripe; third and fourth segments each with a continuous narrow stripe and on each side a large semi-oval anterior spot united with it, of the same coffee-brown colour; the grey thus forms interrupted cross-bands, broader on the outer ends; fifth segment with the spots on the side small, and the median stripe narrow; in the female marked like the fourth; fifth segment of the male a little shorter than the preceding. Legs black, greyish-pollinose; front metatarsi at the base and the basal portion of the four posterior tarsi yellow. Wings lightly tinged; second section of the costal vein more than twice as long as the third. Length 3–4 mm.

Numerous specimens. St. Vincent. This species must be closely allied to *P. appendiculata*, Loew, but differs in lacking the stump of a vein on the fourth vein of the wing.

2. *Paralimna obscura*, n. sp.

♂, ♀. Front opaque dark-brown. Antennæ black, the third joint somewhat yellowish at the base. Face, cheeks and the lower part of the occiput opaque brownish-grey; proboscis and palpi black or dark-brown. Thorax throughout nearly uniform deep brown, moderately shining. Abdomen rather broad, brownish-black, moderately shining; the second, third, and fourth segments with a complete posterior greyish band; fifth segment in the male a little longer than the preceding segment; fifth and sixth segments in the female successively shorter, with an obscure band as in the preceding segments. Legs deep black throughout. Wings nearly hyaline; second section of the costal vein nearly three times the length of the third section; ultimate and penultimate sections of the fourth vein of nearly equal length. Length 4 mm.

Numerous specimens. St. Vincent.

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Discomyza.

Meigen, System. Beschr., vi., 76, 1830.

1. *Discomyza dubia*, n. sp. (Pl. XIII., figs. 138, wing; 138*a*, head of ♂.)

♀. Black, shining. Front, broad above, narrowed below; smooth, the elongated vertical triangle metallic-green and finely punctulate; the anterior part of the front flattened. Antennæ black, the third joint rounded, and with rather long whitish pile on its upper side; arista with seven rays; spine of the second joint moderately strong. Face much narrowed a little above its middle, gently convex from side to side and vertically, the lower part much receding, and the oral opening small; in the middle finely punctulate; on the sides with coarse wrinkles for its whole length; moderately shining, not dusted, its bristles short and small. Clypeus large, much receding, cheeks narrow. Abdomen flattened, ovate; fourth segment much longer than the preceding. Halteres nearly white. Legs black, the posterior tibiæ and all the tarsi, save the distal two joints, yellow. Wings tinged with brownish; third section of the costal vein short, not more than one-third of the length of the second section; penultimate section of the fourth vein not one-half the length of the ultimate section. Length 2 mm.

Numerous specimens. St. Vincent. This species, in its small oral opening and large clypeus, is rather aberrant.

Psilopa.

Fallen, Hydromyzidæ, 1820.

1. Face shining black or metallic-green 4
   Face pollinose 2
2. A minute blackish spot at the tip of the third vein, *nigropuncta*, n. sp.
   No spot at the tip of the third vein 3
3. Antennæ red . . . . . *desmata*, n. sp.
   Antennæ black . . . . . *nigra*, n. sp.
4. Front tarsi deep black; face shining black . . *nigrimana*, n. sp.
   Front tarsi yellow; face shining green . . . *aciculata*, Loew.

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1. *Psilopa nigra*, n. sp. (Pl. XIII., fig. 139, head of ♀.)

♀. Front and face deep black, the former broader than long, a little shining; the latter lightly-dusted, gently and evenly convex in the middle above, the convexity not reaching to the margin of the eye, thus forming a concavity for each antenna; face on the sides below with two stout bristles, the upper one arising very close to the eye. Antennæ black, the third joint oblong; bristle of the second joint stout and long; arista with ten or twelve rays. Clypeus moderately projecting; proboscis and palpi black. Thorax and abdomen black, moderately shining, in an oblique light lightly yellowish greyish-dusted; second, third, and fourth segments of the abdomen of nearly equal length, the fifth a third longer than the preceding; in the female the fifth segment of the same length as the preceding; the sixth less than half the length of the fifth. Legs black; all the tarsi yellow, with the distal joints blackish. Wings greyish or brownish hyaline; second section of the costal vein about one-third longer than the third section; ultimate section of the fourth vein only a little longer than the penultimate section. Length 3 mm.

Two specimens. St. Vincent.

2. *Psilopa nigropuncta.*

♂. Front black, moderately shining, much broader than long. Antennæ black; third joint oblong; bristle of the second joint of moderate size; arista with five rays above. Face densely light grey-pollinose; the structure of the upper part as in *P. nigra*, but the face narrower; on the lower part with two stout bristles on each side, the upper one more remote from the eye than in *P. nigra*. Thorax and abdomen deep shining black, the scutellum opaque. Abdomen broad, the fifth segment a little shorter than the fourth. Legs deep black; all the tarsi yellow, with the terminal joints blackish. Wings greyish; third section of the costal vein a little more than half the length of the second section; penultimate section of the fourth vein about one-half the length of the ultimate section; a minute black spot at the tip of the third vein. Length 2 mm.

One specimen. St. Vincent.

3. *Psilopa nigrimana*, n. sp.

♂. Shining black. Front, with a light depression on each side above the root of the antennæ. First two joints of the antennæ black, the third brown, on the inner underside reddish; spine of

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the second joint stout; third joint oblong; arista with seven or eight rays. Face convex above, gently convex from very near the margin of the eye, the orbital margin being exceedingly narrow; on the lower part the face has very fine grooves. Mesonotum and scutellum thinly yellowish-dusted in an oblique light. Abdomen deep shining metallic-green; fourth segment longer than the third, the fifth about half the length of the third. Legs black; the front coxæ, the base of the front femora, the tip of the four posterior femora, the four posterior tibiæ wholly, and the four posterior tarsi, except the distal joint, yellow; front tarsi stout and deep black, like their tibiæ. Wings greyish hyaline; third section of the costa as long as the second. Length 2 mm.

One specimen. St. Vincent.

4. *Psilopa aciculata.*

Psilopa aciculata, Loew, Monogr., i., 142.—Cuba. (Pl. XIII., fig. 140, wing.)

♂, ♀. Head shining metallic-green. Vertical border very sharp. The bristles of the front are confined to the vertex, two on the ocellar tubercle and two on each side. The vertical triangle is bounded by a well-marked groove, its anterior angle truncated below, just above the base of the antennæ, and continuous to the eyes on the side of the face below. The face is narrower than the front, the eyes approaching each most at a little distance above the oral margin; the face is smooth, gently convex transversely, and with parallel sides from the grooves, which are continuous from the front; nearly opposite the narrowest portion there is a single black bristle on each side. Antennæ yellow; the second joint above and the third in front, reddish; arista black, with about six rays. Mesonotum and scutellum bronze-black, but little shining, finely aciculate; pleuræ more shining green-black. Abdomen brilliant metallic-green, with coppery reflections; first segment very short, the second, third, and fourth successively longer, the fifth again short. Legs black, the knees, tip of tibiæ and all the tarsi yellow. Wings with a distinct yellowish tinge, the basal portion obliquely across to about the middle of the anal cell, blackish; second and third sections of the costal vein of nearly equal length. Length 2 mm.

Five specimens. St. Vincent. This species is rather aberrant from other members of this genus in its colour and structure of the head.

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5. *Psilopa desmata*, n. sp.

♂. Face not broad, a little wider below; gently convex in the middle above, with a depression below each antennæ; opaque yellowish-grey; on either side below with four or five strong bristles, convergent above. Front broader than the face, opaque black, thinly brownish-dusted below. Antennæ yellowish-red, the second joint somewhat blackish in front, and with a moderately strong bristle at its tip; arista with five rays. Cheeks narrow, with a row of strong bristles continuous with those of the sides of the face. Proboscis yellow. Mesonotum deep brown, moderately shining. Pleuræ whitish-pollinose. Abdomen black, moderately shining; first segment short, the others successively increasing in length. Femora black, the immediate tip yellow; tibiæ and tarsi light yellow, the hind tibiæ with a blackish ring in the middle. Halteres yellow. Wings nearly hyaline; second section of the costal vein of nearly the same length as the third, or slightly longer. Length 2 mm.

One specimen. St. Vincent. "Near the sea by open stream." It is possible that this species were better located under *Discocerina*. The third joint of the antennæ is rounded, but the face can not be said to be carinate, though the convexity of the upper part is confined to the middle part.

Discocerina.

Macquart, Hist. Nat. Dipt., Suites a Buffon, ii., 527, 1835; *Clasiopa*, Stenhammer, Monogr. der Ephydr., 251, 1844.

1. Face silvery-grey with a median black stripe . . *nana*, n. sp.
   Face uniform in colour 2
2. Face vaulted, oral opening very large . . . . *facialis*, n. sp.
   Oral opening of moderate size . . . . . .
3. Last abdominal segment largely or wholly silvery-grey *leucoprocta*, Loew.
   Last abdominal segment not unlike the preceding *obscura*, n. sp.

1. *Discocerina leucoprocta.*

? *Discocerina leucoprocta*, Loew, Berl. Ent. Zeit., 1861, 255; Monogr., North Amer. Dipt., i., 148.—Maryland.

♂, ♀. Front opaque yellowish-brown, narrowly whitish on the lower orbital margins. Antennæ reddish-yellow, the third joint orbicular, and blackish on the upper distal part. Fe

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narrowest a little distance below the eyes; opaque greyish-yellow, the orbits silvery-grey, becoming broader below; distinctly keeled on the upper portion, arched below; on either side, near the silvery orbit with two or three stout bristles; cheeks and inferior occipital orbits silvery-grey. Thorax in ground-colour black, opaque greyish-pollinose, the mesonotum somewhat yellowish or brownish. Abdomen opaque black, the anterior segments lightly greyish-pollinose in well-preserved specimens; the fifth segment silvery-grey, except the tip; sometimes the grey is confined to the sides and may also appear on the sides of the preceding segment, especially in the female; in the male the abdomen is elongate conical; in the female more oval. Femora for the most part black; tibiæ yellow with the middle portion more or less brown; tarsi yellow, the distal joints brownish or brown. Wings cinereous hyaline; second section of the costa less than twice the length of the third. Length 1½ mm.

Twenty specimens. St. Vincent. The identity of this species with that which Loew described is somewhat doubtful. The tibiæ in most of the specimens are yellow, with the hind pair blackish in the middle. In none of the specimens is the last abdominal segment wholly silvery-white.

2. *Discocerina nana*, n. sp.

♂. Face considerably narrower than the front, much receding on the lower half, moderately carinate above; densely silvery-white-pollinose on the sides, leaving a deep black, shining, median stripe; the two bristles of the sides not strong. Antennæ yellow, the third joint rounded, blackish on its margin; arista with five rays. Front opaque greyish-black, with an elongate median triangle below the ocelli, and the lateral margins on the lower half opaque black. Thorax deep shining steel-blue or green. Abdomen shining black, with slightly coppery reflections. Legs black, the knees, tips of the tibiæ, and all the tarsi light-yellow. Wings greyish-hyaline; second section of the costa a half longer than the third. Length 2 mm.

Numerous specimens. St. Vincent. The cheeks are narrow.

3. *Discocerina facialis*, n. sp. (Pl. XIII., fig. 141, head of ♂.)

♂, ♀. Front dark-brown, opaque, the sides gently convex, except near the vertex. Antennæ reddish-yellow, the third joint orbicular, brownish on the upper margin. Face broadly arched,

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moderately carinate on the upper part, with the cheeks and occiput silvery-grey; two moderately strong bristles on each side; oral cavity very large. Mesonotum opaque dark-brown: pleuræ opaque grey. Abdomen, like the rest of the body, black in ground-colour, greyish-pollinose; second, third and fourth segments of nearly equal length. Legs black; the knees, base and tip of the front and hind tibiæ, the middle tibiæ wholly, and all the tarsi, save the terminal joint, yellow. Wings cinereous hyaline; third section of the costa two-thirds the length of the second section. Length 1½–2 mm.

Five specimens. St. Vincent. This species is peculiar in the very large oral opening, resembling the forms placed in the vicinity of *Ephydra*, from which, however, it is distinctly separated by the presence of a spinous bristle at the tip of the second antennal joint.

4. *Discocerina obscura*, n. sp.

♂, ♀. Antennæ reddish-yellow; third joint only a little longer than wide, its upper margin, as also that of the second joint, sometimes narrowly blackish; arista with five pectinations. Face black, covered with fine white pubescence or dust, which does not wholly obscure the ground-colour save in an oblique light. Front black, but mostly concealed beneath fine yellow or brownish-yellow pubescence. Thorax black, shining through the thin brownish dust; pleuræ thinly greyish-dusted. Abdomen black, moderately shining; oval, the fifth segment of the male much longer than the preceding one. Legs black, the tip of the tibiæ, the knees and the tarsi light-yellow, the distal joints of the last brownish. Wings greyish-hyaline; second section of the costal vein a half longer than the third. Length 2–2½ mm.

Numerous specimens. St. Vincent.

Arthyroglossa.

Loew, Neue Beitr., vii., 12, 1860.

1. *Arthyroglossa nitida*, n. sp. (Pl. XIII., fig. 142, head of ♂.)

♂, ♀. Front wholly shining black, flattened or depressed on the anterior portion. Antennæ black, the third joint somewhat reddish and pubescent; arista with six rays. Face deep shining black, gently convex transversely; clypeus large, prominent, oval, convex, shining black like the face. Face on the sides near the

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lower margin of the eye with wrinkles or rugosities. Thorax deep shining black, smooth; scutellum concolorous. Abdomen black, less shining than the thorax, finely scrobiculate under high magnification; first and fifth segments very short, scarcely visible, the second and third of nearly equal length, the fourth longer than the third; the abdomen is elongate, oval in shape, and is much flattened. Legs black; the tip of the four posterior tibiæ, the first two joints of the front tarsi, and the first three joints of the other tarsi light-yellow. Wings tinged with brown; third section of the costal vein less than half the length of the second section. Length 2½ mm.

Two specimens. St. Vincent. The species seems to be a typical *Arthyroglossa*.

Hecamedæ.

Haliday, Annals Nat. Hist., iii., 224, 1839.

1. *Hecamede abdominalis*, n. sp.

♂. Front opaque brown, the frontal lunule whitish. Antennæ black, the first two joints whitish above; third joint orbicular. Face brown on the upper part, the lower portion, the cheeks and the posterior orbits silvery-grey; the orbital space, bounded by the curved line, exceedingly narrow above, becoming broad below the eyes; near this line on either side below there are two moderately strong bristles; face in the middle strongly carinate, or subtuberculate; clypeus projecting, of the colour of the lower part of the face. Mesonotum, scutellum, and upper part of the pleuræ opaque dark-brown; a narrow stripe just above the dorso-pleural suture, to the root of the wings, silvery-grey; lower part of the pleuræ and the metanotum grey, all opaque. Abdomen broadly oval, the first and fifth segments concealed, the fourth long; opaque silvery grey, the second segment more or less brownish-grey. Legs black; all the tarsi, except the terminal joint, yellow. Wings whitish; third section of the costa about half the length of the second section. Length 1½ mm.

Five specimens. St. Vincent. Because of the narrowness of the first and fifth segments, the abdomen appears to be composed of but three segments, the chief characteristic of *Trimerina*. However, the same character appears in some of the species placed under *Hecamede*, and while the colorational differences from the known species of *Trimerina* are marked, they very closely

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resemble those of *H. lateralis*, Loew, from Europe. I doubt not that the species belongs wherever *H. lateralis* does; in fact, I am not quite sure that the species may not be identical, for the deeper colour of the present species seems to be the chief difference between them. The cheeks cannot be called broad, nor the median carina "warzenformig."

Hydrellia.

Rob. Desvoidy, Myodaires, 790, 1830.

1. *Hydrellia parva*, n. sp. (Pl. XIII., fig. 143, wing.)

♂. Front broad, distinctly broader than long, somewhat flattened above the antennæ; opaque brownish-black. Antennæ short, the first two joints blackish, the third blackish above, somewhat reddish below. Arista with six long pectinations on the upper side, and two or three short ones distally below. Eyes very closely pubescent. Face opaque, a little more greyish than the front; in the middle below with a moderate convexity; on the sides below with two or three bristles. Clypeus narrow. Cheeks narrow; below the eyes with a long, stout bristle, and a smaller one further back. Thorax short, rounded; black, but thickly covered like the front with brownish-greyish dust; on the pleuræ more greyish. Halteres light-yellow. Abdomen black, but little shining, thinly greyish-dusted. Legs black; all the tarsi, except the terminal joint or joints, yellow. Wings greyish hyaline, with stout black veins; neuration as in the figure. Length 1 mm., or less.

One specimen. St. Vincent. This species belongs doubtfully in this genus. The pubescence of the eyes is exceedingly short and erect, visible only under the highest magnification.

2. *Hydrellia pulchra*, n. sp. (Pl. XIII., fig. 144, wing.)

♂. Front opaque black, the narrow orbits and the margins of the large vertical triangle grey. Antennæ yellow; third joint large, longer than wide, convex on its lower border, nearly straight above, its upper half black; arista with seven or eight pectinations. Face opaque yellowish-grey; much narrowed a little above its middle, with a slender groove running downward from each antenna on the cheek; between the grooves the narrow space is convex; below on the sides with two or three fine bristles. Eyes

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rather long silvery pubescent. Mesonotum opaque dark-brown or black, with six series of yellowish-grey, more or less irregular yellowish-grey spots, forming stripes; scutellum opaque black; pleuræ grey-pollinose. Abdomen shining black; a narrow, yellow pubescent, interrupted, posterior band on the second and third, perhaps also on the fourth and fifth segments. Legs yellow; the femora except the immediate tip and the last joint of all the tarsi black; hind tibiæ with a brown ring before its middle. Wings yellowish hyaline; an arcuate black band beginning at the tip of the first vein, which is thickened and deep black, and extending to the posterior edge of the wing; third section of the costal vein a little longer than the second. Length 1½ mm.

One specimen. St. Vincent.

Hydrina.

Rob. Desvoidy, Myod., 1830; *Philygria*, Stenhammer, Monogr. der Ephydr., 238, 1844.

1. *Hydrina nitida*, n. sp. (Pl. XIII., figs. 145, wing; 145*a*, head of ♂.)

♂. Front composed almost wholly of the shining black vertical triangle, leaving only a narrow margin opaque black and silvery. Antennæ black; third joint light-yellow on the lower half, much longer than broad; arista short pectinate. Face very narrow, gently convex from side to side, without grooves, receding below, in colour silver-white; bristles of the sides below weak; inferiorly the sides and the cheeks are shining black. Clypeus concealed. Eyes very sparsely pubescent. Thorax deep black; mesonotum much shining; scutellum opaque; the pleuræ whitish dusted. Abdomen shining black; fourth segment about as long as the two preceding together. Legs wholly light-yellow as are also the coxæ. Wings yellowish or brownish hyaline; third section of the costal vein longer than the second; penultimate section of the fourth vein very short, the posterior cross-vein remote from the border of the wing. Length 1 mm.

One specimen. St. Vincent. Notwithstanding the pectination of the arista I locate this species under *Hydrina*, by reason of the comparative bareness of the eyes, the structure of the face, and the position of the posterior cross-vein. According to the canons of zoological nomenclature the genus *Hydra* and its family termination *Hydrinæ* do not conflict with the name *Hydrina*, and it should have priority over *Philygria*.

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2. *Hydrina nitifrons*, n. sp.

♂. Front broad and short, wholly shining black. Antennæ yellow; all the joints blackish on the upper margin; third joint more than twice as long as broad, hairy on the upper border; arista pubescent. Face black, lightly silvery dusted; convex from side to side and gently receding below; bristles of the sides small and short. Cheeks very narrow. Eyes very sparsely pubescent. Thorax deep black; mesonotum and scutellum shining, the pleuræ whitish dusted; the mesonotum has two strong bristles near the middle, and the scutellum two equally strong ones on its margin. Abdomen shining black. Legs light yellow, the last two joints of the tarsi black; coxæ black. Wings nearly hyaline; third section of the costa two-thirds the length of the second section; penultimate section of the fourth vein short. Length 1 mm.

One specimen. St. Vincent. In the structure and markings of the head, except the arista, this species agrees closely with *H. nitida*; the face is somewhat broader. The second section of the costal vein and the penultimate section of the fourth vein are longer.

OCHTHEROIDEA, n. g.

Small, black species. Eyes bare. Front broad, slightly narrower in front. Face narrowest a little distance below the antennæ, lightly concave above, and with a shallow depression under each antenna. Face on each side below slightly wrinkled. Cheeks broad, the oral cavity rather small. Clypeus projecting. Face and cheeks wholly without bristles save two or three small ones on the sides of the former. Second joint of the antennæ with a small, short bristle at its tip; third joint oval, with a pectinate arista. Bristles of the vertex and the thorax very short and thin. Abdomen much flattened, elongate oval; first and fifth segments short, the others successively increasing in length. Front femora incrassate, and with a row of short spines on the under distal third; claws and pulvilli normal; all the tarsi slender. The costa reaches to the fourth vein; third and fourth veins parallel. Middle tibiæ without bristles on the outer side.

1. *Ochtheroidea atra*, n. sp. (Pl. XIII., figs. 146, wing; 146*a*. front leg of ♂.)

♂. Front and face shining, submetallic black. Antennæ black, the third joint whitish pubescent, the arista with five or six rays. Thorax and abdomen deep opaque, the pleuræ moderately shining.

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Wings smoky hyaline, distinctly clouded at the tip. Legs black; the first two joints of the front tarsi and the four posterior tibiæ and tarsi, except the terminal joints of the latter, light-yellow. Length 3 mm.

Twelve specimens. St. Vincent.

Ochthera.

Latreille, Hist. Nat. Crust. et Ins. xiv., 1804.

1. *Ochthera cuprilineata*, n. sp. (Pl. XIII., fig. 148, wing.)

♂, ♀. Front with a large shining black spot, leaving the lateral and front margins opaque brown. Antennæ black. Face opaque, light-yellow, with a median, shining black spot. Palpi light yellow. Cheeks and posterior orbits opaque light-yellow. Mesonotum and scutellum sub-shining, lightly bronze or brassy, the former with three dark purple and coppery stripes. Pleuræ lighter, on the lower part shining black. Abdomen metallic-bronze colour; in some specimens the second and third segments with a narrow shining black posterior band, apparently due to the detrition of the metallic covering. Legs black; the femora with more or less of the metallic covering, like that of the mesonotum. Front coxæ white dusted, with a shining black spot on the outer side; front tibiæ in part, and all the tarsi, save the distal joints and the swollen hind metatarsi, red. Wings lightly clouded; somewhat yellowish on the costa in front. Length 5 mm.

Eight specimens. St. Vincent.

Ephydra.

Fallen, Hydromyzidæ, 1820.

1. *Ephydra pygmæa*, n. sp. (Pl. XIII., figs. 147, wing; 147*a*, head.)

♂, ♀. Front opaque velvety black, the large ocellar triangle shining. Antennæ black, the third joint rounded; arista bare or very short pubescent. The vaulted portion of the face shining metallic-green, very lightly yellowish dusted; border of the mouth with a number of hairs on each side; otherwise the face is bare, except some weak bristles on the sides inferiorly. Wings clouded with blackish grey. Legs black, not at all shining, the tarsi and portions of the tibiæ more brownish. Halteres yellow. Hypopygium very small; fifth segment longer than the fourth. Length 2¼ mm.

Fifteen specimens. Perseverance Valley, St. Vincent.

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Scatella.

Rob. Desvoidy, Myod., 801, 1830.

1. *Scatella obscura*, n. sp.

♂, ♀. Black. Face with brownish dust, opaque, the bristles in front and on the margin moderately long. Bristle of antennæ with long pubescence. Front, thorax, and abdomen (in unrubbed specimens) only a little shining, with brownish dust. Legs black. Wings smoky, with five small, uniform, rounded, hyaline drops, the first in the submarginal cell, two in the first posterior cell, and one on each side of the posterior cross-vein. The costal vein attains the tip of the fourth vein. Second, third, fourth, and fifth (♀) segments of the abdomen of nearly equal length. Length 2 mm.

Eight specimens. St. Vincent.

Ilythea.

Haliday, Annals Nat. Hist., iii., 408, 1839.

1. ? *Ilythea flavipes*, n. sp.

♂. Front short and broad, opaque brown, the black ground-colour somewhat shining through the dust. Face opaque grey; very broad and arched below; on the upper part gently carinate in the middle, the carina ending in an angle whence the face recedes markedly to the oral margin; orbital ridges very narrow; across the narrowest part of the face brownish; on the sides near the most prominent part of the face with a row of rather weak bristles; a single small bristle near the lower border of the eyes; otherwise the face is entirely bare. Thorax deep black, shining, with some metallic reflections; when seen obliquely, with a fine yellowish pubescence, which is more apparent on the pleuræ; metanotum greyish dusted. Abdomen deep shining black, somewhat metallescent; broadly oval in shape, the second, third, and fourth segments of nearly equal length, the fifth longer. Legs yellow, the tip of the tarsi brownish. Wings nearly hyaline, with narrow brown spots forming incomplete bands; the first begins at the end of the first vein, and reaches to the fourth, and is curved; the next spot is in the middle of the submarginal cell; another between this and the tip of the cell, two others in the first posterior cell, and the posterior cross-vein is clouded; second and third section of the costal vein of nearly equal length. Antennæ black, the third joint on the under-half reddish-yellow; arista with eight rays. Length 2 mm.

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Two specimens. St. Vincent. Sea-level. This species does not fully agree with the characters of *Ilythea* in the structure of the face, but the differences are not sufficient to establish a new genus, which would otherwise be required.

DROSOPHILIDÆ.

Stegana.

Meigen, Syst. Beschr., vi., 79, 1830.

Front uniformly reddish or yellowish ; legs yellow . *tarsalis*, n. sp.
Front with a broad, black hour-glass-shaped stripe ; legs for the most part blackish . . . . . *horæ*, n. sp.

1. *Stegana tarsalis*, n. sp. (Pl. XIII., figs. 149, front leg of ♂ ; 149*a*, middle tarsus of ♂ ; 149*b*, palpus; 149*c*, wing.)

♂. Front at the anterior end about one-fourth of the width of the head, at the vertex about one-third ; reddish-yellow, shining. Antennæ yellow, the third joint on the distal half or two-thirds black ; about three times as long as wide, gradually tapering ; arista long-plumose. Face, cheeks and occiput, except at the upper part, light-yellow ; palpi yellow, the tip brownish. Mesonotum and scutellum brownish-red, shining ; scutellum flattened, with a sharp border; pleuræ with a horizontal, deep brown or black stripe, above which the colour is more like that of the mesonotum, below which the colour is light-yellow. Abdomen elongate ovate, brownish-black in colour. Legs light-yellow, all the femora brownish near the extremity ; second, third, and fourth joints of the front tarsi much dilated transversely and deep black in colour ; middle and hind tarsi short and strong, compressed ; hind tibiæ dilated ; front femora with some bristles at the onter part. Wings deep brown anteriorly, becoming less strong posteriorly ; second vein nearly parallel with costa for a large part of its length ; third strongly convex anteriorly; first posterior cell very narrowly open; ultimate section of the fourth vein not twice the length of the penultimate section. Length 3 mm.

♀. Third joint of the antennæ a little larger ; front tarsi not dilated and wholly yellow.

So far as I am able to learn from the literature at my command, but two species of this genus have been hitherto made known, *S. curvipennis*, Fallen, and *S. coleo-*

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ptrata, Scop., both European, and both said to occur in North America, by Loew. In the descriptions of *S. coleoptrata*, to which species the above seems closely allied, no mention is made of the peculiar male tarsi.

2. *Stegana horæ*, n. sp. (Pl. XIII., fig. 150, antenna of ♀.)

♀. Front narrower above than in *S. tarsalis*; yellow, with a broad, black, hour-glass-shaped stripe reaching nearly to the root of the antennæ. Antennæ yellow; third joint except the upper basal portion, black, rather longer than in *S. tarsalis*. Face yellow; cheeks black below the eyes. Proboscis yellow; palpi black. Occiput on the lower portion, yellow. Mesonotum and scutellum deep brown, almost black; a large spot on the humeri light-yellow. Pleuræ light-yellow with a horizontal black stripe, connected with the black of the mesonotum near the root of the wings; below this stripe there is a narrow yellow one above the black or dark-brown coxæ. Abdomen black. Legs deep brown, the knees, the tip of all the tarsi, the basal portion of the four posterior tibiæ, and all the tarsi light-yellow; tarsi less compressed than in *S. tarsalis*; middle tibiæ with a row of bristles on the outer side; front femora with a few long bristles near the outer end. Wings as in *S. tarsalis*. Length 3 mm.

Two specimens. St. Vincent.

Drosophila.

Fallen, Dipt. Suec., Geomyzid., 4, 1823.

The present collection includes, as is seen, a very large number of species belonging to this genus. I have scrutinized them with the utmost care, and have given, I trust, descriptions which will enable them to be recognized again. I have been able to recognize but a single species previously described, though it is possible that there may be others which have been already named. The difficulty in the determination of the obscurer coloured species from remote localities, is, however, so great that only a direct comparison of specimens from different habitats will settle the question of their identity. Two species are included in the list (Nos. 17 and 18) which may not properly belong to the genus, but which would in all probability be sought for here.

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1. *Drosophila ornatipennis*, n. sp. (Pl. XIII., fig. 151, wing.)

♂, ♀. Front broad, light-yellow above, somewhat orange-yellow below. Remainder of head yellow. Third joint of the antennæ oval; face carinate. Mesonotum opaque-yellow, with six narrow dark-brown stripes, the middle pair coalescent, and the outermost ones connected at the suture with the adjacent ones. Abdomen opaque, deep brown, with interrupted grey cross-bands. Legs yellow; femora sometimes infuscated. Wings variegated; a blackish spot at the proximal end of the submarginal and the first basal cells, including also the outer part of the costal cell; one on the anterior cross-vein; a narrow one on the posterior cross-vein and outer part of the fifth vein; a larger one about the middle of the second section of the costal vein, reaching to the third vein, and continues less deeply coloured in the anterior portion of the first basal cell with that on the posterior cross-vein, and more or less completely with ones on the outer ends of the second, third and fourth veins, the colour surrounding these spots is more purely hyaline, in the posterior cells and anal angle, subhyaline. Length 2 mm.

Numerous specimens. St. Vincent.

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2. *Drosophila vittatifrons*, n. sp. (Pl. XIII., fig. 152, wing.)

♂, ♀. Front about one-third of the width of the head, a little broader above; yellow, the slender shining median triangle reaching two-thirds of the distance to the root of the antennæ, on either side of which there is a deep brown or black stripe, the two convergent anteriorly. Antennæ yellow, third joint somewhat brownish, and elongate oval in shape. Face pallid-yellow, in the middle with a very prominent carina; cheeks with a brownish spot below the eyes. Palpi blackish at the tip; proboscis and the lower portion of the occiput, yellow. Mesonotum shining yellow with six slender brown stripes, the median pair separated by a line, the outer ones not continued in front of the suture; more outwardly in front, on either side there is a slender strigula reaching as far as the suture. Pleuræ and legs wholly yellow. Abdomen black, the immediate base yellowish; the narrow lateral margin of the second and third segments, and the fourth and fifth except a median triangle, yellow. Wings nearly hyaline; a blackish subquadrate spot at the tip of the wing, in the submarginal and first posterior cell, reaching from the tip of the second to the tip of the fourth vein; second section of the costal vein more than twice the length of the third section. Length $1\frac{3}{4}$–2 mm.

Numerous specimens. With these specimens there are several in which the front is yellow or brownish-yellow, and the spot at the tip of the wing is apparent only as a blackish cloud. They appear to be immature specimens.

3. *Drosophila sororia*, n. sp.

♂, ♀. Head and antennæ yellow, opaque; front rather more than one-third of the width of the head, a little broader above; arista with only a few rays. Thorax light reddish-yellow, opaque. Abdomen reddish-brown or blackish, probably in life with black hind margins to the segments. Legs wholly yellow. Wings lightly tinged with blackish, more noticeable along the costa and at the tip; a rather broad, dark cloud on the cross-veins, and indistinct clouds on the veins at the tip of the wing, that of the second vein, however, distinct; third section of the costal vein short; posterior cross-vein straight. Length $1\frac{1}{4}$ mm.

Four specimens. St. Vincent.

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4. *Drosophila annulata*, n. sp.

♂, ♀. Front less than one-third of the width of the head; silvery-grey and opaque black. Antennæ reddish-yellow, the first joint above, and the third at the base, blackish. Face blackish, greyish dusted; median carina yellowish, nose-like, subsulcate. Mesonotum opaque coffee-brown, with narrow, irregular, yellowish-grey markings. Scutellum darker brown, its basal angles and the apex greyish. Abdomen black, the narrow angles of the segments yellow, forming more or less complete bands, and a narrow yellow stripe in the middle of the posterior segments. Femora, except the yellow tip, dark brown; tibiæ yellow, with a basal and terminal brown ring; tarsi yellow. Wings subhyaline, with blackish clouds on the cross-veins, and a black spot at the tip of the first section of the costal vein. Length 2½ mm.

Fifteen specimens. St. Vincent.

5. *Drosophila bilineata*, n. sp.

♂. Front of equal width, not widened above; opaque velvety black, the orbits and a slender median line opaque yellowish-grey. Face light yellow, on the sides above dusted like the frontal orbits. Cheeks and the dilated palpi black, the cheeks yellow behind. Face distinctly receding, carinate in the middle. Antennæ brownish-yellow or brown, the third joint more than twice as long as wide; arista with about five rays above and three below. Occiput black above. Mesonotum and scutellum opaque deep brown, the former with two narrow stripes, not reaching the hind margin, and appearing like continuations of the frontal orbits. Pleuræ light-yellow. Abdomen oval, not elongate; opaque deep brown or black, the fifth segment, except sometimes a small spot in the middle, the remainder of the abdomen, and the narrow lateral margin of all the segments yellow. Legs light-yellow. Wings greyish hyaline; ultimate section of the fourth vein not twice the length of the penultimate section. Length 1⅞ mm.

Three specimens. St. Vincent.

6. *Drosophila coffeata*, n. sp.

♂, ♀. Dark coffee-brown. Front at the lower part a little less than one-third of the width of the head, with two opaque, anteriorly convergent, velvety black stripes. Basal joints of the antennæ yellowish, the third joint brownish on its margin, only a little longer than broad; arista with four rays above. Face yellow,

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brown in the middle; strongly carinate. Mesonotum with three inconspicuous whitish stripes in front. Scutellum black, brownish pollinose in an oblique light. Pleuræ nearly black. Abdomen black or brownish-black. Legs luteous. Wings tinged with brownish; ultimate section of the fourth vein not twice the length of the penultimate section; third section of the costal vein less than half the length of the second section. Length 3–4 mm.

Numerous specimens. St. Vincent.

7. *Drosophila bellula*, n. sp.

♂, ♀. Front broader above; the orbits yellowish, in the middle a large truncated triangle brown, the inner portion of which—the vertical triangle—lighter coloured, or yellow. Antennæ yellow, the base in the larger part of the short third joint blackish; arista pectinate above and below. Face and cheeks yellow, the former carinate. Mesonotum brown, with three greyish-yellowish stripes, the middle one broader and more diffuse in front, narrow behind. Scutellum brownish, yellowish on the borders. Pleuræ brown, with two slender yellowish stripes. Abdomen black or dark brown, the segments with a more or less narrow yellowish anterior border. Legs yellow. Wings yellowish hyaline; second section of the costa about three times the length of the third section. Length 2 mm.

Eight specimens. St. Vincent.

8. *Drosophila fasciola*, n. sp.

♂, ♀. Front broader above; the orbital margins yellowish (at their lower part a brownish spot); two convergent brown stripes, within which the vertical triangle is lighter coloured; the front is wholly opaque. Antennæ yellowish; the short third joint brown at the base. Face yellowish, the thin median carina nose-like, not appreciably sulcate. Cheeks brown. Mesonotum opaque greyish-yellowish, with incomplete brown stripes and irregular spots; in the middle behind, the brown forms a large triangle, bisected by a slender yellowish line. Scutellum opaque yellowish, brownish towards its base; the four bristles each arise from a small blackish spot. Pleuræ brown, yellowish vittate. Abdomen brown, the segments yellow or yellowish in front. Wings yellowish hyaline; tip of the first section of the costa black; third section of the costa not one-half the length of the second section. Legs yellow; base of all the femora brown or blackish; all the tibiæ with a proximal and distal brown ring. Length 2 mm.

Five specimens.

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9. *Drosophila opaca*, n. sp.

♂, ♀. Front broad, more than one-third of the width of the head, considerably broader above; deep opaque black. Antennæ reddish-brown or blackish, the third joint more or less blackish on the upper margin; second joint tumid, with two or three bristles; third joint about twice as long as wide; arista with long rays, about eight in number, on the upper side. Face black, lightly dusted; cheeks narrow. Palpi black. Mesonotum and scutellum wholly deep opaque, velvety black. Pleuræ opaque black, yellow below, a slender yellow line along the dorso-pleural suture. Halteres yellow. Abdomen opaque black and light-yellow; the first segment yellow; the next three segments yellow, with the sides black, extending more or less across the hind margin, and leaving the yellow as a semi-oval space; fifth segment yellow, with a posterior band; sixth segment yellow. Legs, including the coxæ, wholly light-yellow. Wings with a distinct brownish tinge; penultimate section of the fourth vein about one-half the length of the ultimate section; the third vein terminates at the extreme tip of the wing; third section of the costal vein more than one-half the length of the second section. Length 1½ mm.

Numerous specimens. St. Vincent.

10. *Drosophila thoracis*, n. sp.

♀. Front a third of the width of the head, broader above; opaque or brown or black, the narrow orbits and median triangle shining. Antennæ lutescent yellow, the third joint a little blackish and rather elongate. Face luteous yellow, distinctly carinate above, the oral margin narrowly blackish. Cheeks yellow behind. Proboscis yellow. Mesonotum shining deep brown or nearly black. Scutellum black, shining. Uppermost part of the pleuræ, near the dorso-pleural suture, black, below light-yellow; metanotum nearly black. Abdomen shining black, the middle of the first and second segments, anterior border of the fourth and fifth segments and the ovipositor, yellow; third segment yellow with a narrow, interrupted black band. Venter and legs light yellow. Wings yellowish hyaline; the third costal section two-thirds of the length of the second section. Length 2 mm.

Two specimens. St. Vincent. "In fungi."

11. *Drosophila pleuralis*, n. sp.

♀. Front yellow below, on the upper part blackish. Antennæ reddish or yellowish, the third joint more or less infuscated and rather long; arista with five rays above. Face,

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cheeks, and the lower part of the occiput light-yellow; facial carina small. Mesonotum and scutellum deep shining black or nearly black. Pleuræ and legs wholly light-yellow. Abdomen black, moderately shining, the fifth segment on the sides and the venter yellow. Wings nearly hyaline, the third section of the costal vein little more than one-half the length of the second section; penultimate section of the fourth vein about one-third the length of the ultimate section. Length 2 mm.

One specimen. St. Vincent.

12. *Drosophila splendida*, n. sp.

♂, ♀. The large frontal triangle metallic-blue, the sides more brownish and the frontal lunile yellow. Antennæ yellow, the third joint somewhat brownish; arista thickly and long plumose. Face opaque yellow, somewhat blackish in the concavities, with a slight median carina. Mesonotum brilliant deep metallic-blue; scutellum deep opaque black; pleuræ black but little shining. Abdomen black, the basal segments more or less yellow, apparently in life with distinct markings. Legs yellow; all the femora more or less black. Wings greyish or yellowish hyaline; third section of the costal vein two-thirds the length of the second section. Anal cell incomplete. Length 2 mm.

Four specimens. St. Vincent.

13. *Drosophila punctulata.*

Drosophila punctulata, Loew, Centur., ii., 100.—Cuba.

Four specimens. St. Vincent.

14. *Drosophila procnemis*, n. sp.

♂. Front broad, broader above; opaque yellow, the narrow orbits greyish. Antennæ yellow, the third joint brownish; arista with three or four rays above and two below. Face and cheeks yellow, the former not carinate, the latter narrow. Thorax shining reddish-yellow, with black hair. Abdomen rather elongate, deep shining black. Legs yellow, the front femora for the most part, the front tibiæ and the front metatarsi deep brown or black, the remaining joints of the front tarsi light-yellow. Wings tinged with greyish; the third and fourth veins are gently convergent, the former terminating at the tip of the wing; the

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Explanation of Plate XIII.

Fig. 130. *Trypeta* (*Ensina*) *peregrina*, wing.
131. „ (*Evaresta*) *melanogastra*, wing.
132. „ (*Urellia*) *solaris*, wing.
133. *Physogenua nigra*, ♂ head.
134. *Sapromyza angustipennis*, wing.
135. *Heteroneura flavipes*, wing.
136. „ *valida*, wing.
137. *Trigonometopus rotundicornis*, ♂ head.
138. *Discomyza dubia*, wing, 138*a* ♂ head.
139. *Psilopa nigra*, ♀ head.
140. „ *aciculata*, wing.
141. *Discocerina facialis*, ♂ head.
142. *Arthyroglossa nitida*, ♂ head.
143. *Hydrellia parva*, wing.
144. „ *pulchra*, wing.
145. *Hydrina nitida*, wing, 145*a* ♂ head.
146. *Ochtheroidea atra*, wing, 146*a* ♂ front leg.
147. *Ephydra pygmæa*, wing, 147*a* head.
148. *Ochthera cuprilineata*, wing.
149. *Stegana tarsalis*, ♂ front leg, 149*a* ♂ middle tarsus, 149*b* palpus, 149*c* wing.
150. „ *horæ*, ♀ antenna.
151. *Drosophila ornatipennis*, wing.
152. „ *vittatifrons*, wing.

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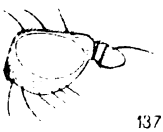
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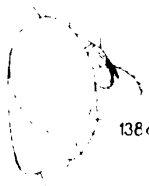
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third section of the costal vein is about three-fourths the length of the second section, and the penultimate section of the fourth vein about one-third the length of the ultimate section; costal cell infuscated; anal cell complete. Length 2 mm.

Four specimens. The wings are whitish at the tip.

15. *Drosophila frontalis*, n. sp.

♂, ♀. Front narrow, more than twice as long as wide, less than one-third of the width of the face, of equal width above and below, and not wider than the face; opaque light-yellow, in some specimens with a shade of brown above. Third joint of the antennæ fully twice as long as wide. Antennæ, face, and lower part of the occiput light-yellow, the occiput elsewhere blackish; cheeks linear; face not carinate. Mesonotum and scutellum light reddish-yellow, moderately shining. Pleuræ light-yellow. Abdomen yellow or light reddish-yellow, rather elongate; the second segment, except the narrow front margin, the third and fourth segments each with three spots, of which the median one is the larger, black; fifth segment of the female small, with a black spot on each side. Legs wholly light-yellow. Wings yellowish or greyish hyaline; third section of the costal vein less than half the length of the second section; penultimate section of the fourth vein less than half the length of the ultimate section; the costal vein terminates at the tip of the third vein. Length 2½ mm.

Eight specimens. St. Vincent.

16. *Drosophila verticis*, n. sp.

♀. Front very broad above; yellow, the vertical stripes and a stripe or spot near the orbits, metallic-blue; lower part of the front wholly yellowish. Antennæ yellow, the third joint brown; arista with long rays above and below. Face yellow, flat, not carinate. Mesonotum shining reddish-yellow; scutellum opaque brown on its upper surface. Pleuræ more brown. Abdomen apparently yellow, with brown posterior bands to the segments. Legs yellow. Wings nearly hyaline; third section of the costal vein two-thirds or more the length of the second section; anal cell incomplete, the vein closing the cell outwardly indistinct or wanting. Length 2 mm.

Two specimens. St. Vincent.

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17. *Drosophila*, sp. ?. (Pl. XIV., fig. 153, wing.)

♂. Deep shining black. Front very broad, broader than long. Antennæ blackish; third joint narrow and pointed. Face not more than half the width of the front, gently convex in the middle, the narrow orbits, the inferior margin and the cheeks greyish dusted. Legs, including the front coxæ, wholly light-yellow. Wings nearly hyaline; third costal section a little longer than the second. Length 2 mm.

One specimen. "Union Is., Oct."

18. *Drosophila pollinosa*, n. sp.

♂. Black in ground-colour, thickly pollinose. Front longer than broad, only a little broader above; densely yellowish-grey pollinose, with four rows of bristles, the median ones not extending quite as far as the orbital ones. Antennæ reddish-yellow, the third joint rounded, the arista with but few rays on the upper side. Face greyish-pollinose, like the front, flat or with a slight carina above; vibrissæ present; cheeks not broad. Thorax densely pollinose, the mesonotum and scutellum yellowish-grey, the pleuræ more grey; apex of the scutellum reddish. Abdomen black, yellowish-grey dusted. Legs reddish-yellow. Wings nearly hyaline; anterior cross-vein situated before the insertion of the first vein; third section of the costal vein only a little shorter than the second section Halteres yellow. Length 2 mm.

Two specimens. St. Vincent. In all probability the present species belongs among the *Ephydridæ*, but the very flat face and the presence of vibrissæ will lead one to search for the species in this genus. The presence of the additional row of frontal bristles, the few rays to the antennal arista, the small carina, and the partial absence of the anal cell are all characters out of accordance with those of this genus, as well as the general colouring of the species.

19. *Drosophila limbata*, n. sp.

♂, ♀. Head, thorax and legs yellow or reddish-yellow, but little or not at all shining; third joint of the antennæ brownish; face carinate. Abdomen yellow, with a posterior black band to the segments, the bands broader in the middle and narrow at the sides. Wings distinctly clouded with blackish along the front border, filling out the costa, marginal and submarginal cells, and reaching

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the middle of the first posterior cell; behind, the wing is distinctly lighter coloured, but not hyaline; on the posterior cross-vein there is an indistinct cloud; third section of the costal vein about one-third the length of the second section. Length 2 mm.

Twelve specimens. St. Vincent.

20. *Drosophila pallida*, n. sp.

♂, ♀. Yellow, not shining, the mesonotum light reddish-yellow and a little shining; face obtusely carinate above, not nose-like. Abdomen reddish-yellow, with a narrow brownish posterior border to the segments. Front broad, broader above. Wings distinctly yellowish; second section of the costal vein fully twice the length of the third section. Length 1¾ mm.

Twelve specimens. St. Vincent. In most of the specimens the narrow brown bands of the abdomen are visible, but in some the whole abdomen is brown. The penultimate section of the fourth vein is very nearly equal to one-half the length of the ultimate section. A single female specimen agrees in other respects but has the third costal section about three-fourths the length of the second section and the penultimate section of the fourth vein not more than one-third the length of the ultimate section.

21. *Drosophila similis*, n. sp.

♂, ♀. Very much like *D. pallida*, but is larger, and the third section of the costal vein is very short, not longer than the penultimate section of the fourth vein. The second and third veins are parallel through nearly their whole length, and the second vein is unusually long. In most of the specimens the abdomen is brown, but in some there are black or brown bands as in *D. pallida*. The colour is reddish-yellow, sometimes more purely yellow. Length 2–2½ mm.

Numerous specimens. St. Vincent.

22. *Drosophila illota*, n. sp.

♀. Yellowish or brownish-red, the abdomen brown or blackish, the legs yellow. Front as broad or broader than long, a little wider above, opaque brownish or ochraceous yellow, the ocellar tubercle blackish. Third joint of the antennæ twice as broad as long, blackish; arista with two or three rays on the under side.

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Face more yellowish, in the middle with a strong, obtuse carina, leaving a deep depression on each side in which is lodged the antenna. Palpi and proboscis yellowish. Mesonotum a little shining. Abdomen more reddish toward the base. Wings with a brownish tinge; penultimate section of the fourth vein about one-half as long as the ultimate section; posterior cross-vein nearly as long as the ultimate section of the fifth vein; third section of the costa not half the length of the second section. Length 2½ mm.

Two specimens. St. Vincent.

23. *Drosophila nana*, n. sp.

♂, ♀. Front a little broader above; brown, somewhat yellowish below. Antennæ yellow, the third joint oval, brownish. Face obscure yellowish-brown; carina small, low, confined to the upper part of the face. Arista with four or five rays above and two long ones below. Mesonotum yellowish-brown, shining; pleuræ more blackish. Abdomen oval, black, shining. Legs lutescent yellow. Wings yellowish hyaline; third section of the costal vein more than one-half the length of the second section; anal cell incomplete, its outer cross-vein indistinct. Length 1¾ mm.

Six specimens. St. Vincent.

Phortica.

Schiner, Wien. ent. Monatschr., vi., 1862. *Amiota*, Loew, Centur., ii., 93, 1862.

1. *Phortica scutellaris*, n. sp.

♀. Front opaque black, brownish pollinose, a little wider posteriorly, less than one-third the width of the head. Antennæ brownish-yellow or yellow, the first two joints brownish; arista long plumose. Face flattened, grey pollinose. Thorax black, thinly greyish-yellowish pollinose and but little shining; scutellum flattened, opaque-black. Abdomen black or brownish-black, more or less yellowish in the middle and at the tip; venter yellow. Legs wholly light-yellow. Wings greyish hyaline, distinctly pubescent; cross-veins approximated, the penultimate section of the fourth vein scarcely as long as the first section of the third vein; second and third veins nearly parallel, the distance between

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their tips not twice as great as that between the tips of the fourth and third veins.

♂. Second, third, and fourth joints of the front tarsi dilated, the first joint stout; the whole tarsi and the tip of the tibiæ blackish.

Length 2 mm.

Five specimens. St. Vincent. I refer this species with some doubt to the present genus, as it does not have the typical markings of *Phortica*. There is a complete posterior basal cell; otherwise the species resemble those of *Drosophila*. The oral vibrissæ are weak. The bristles of the front are strong and reach nearly to the oral margin; there is no preapical bristle to the hind tibiæ.

OSCINIDÆ.

Elachiptera.

Macquart, Hist. Nat. Dipt. Suites a Buffon, ii., 621, 1835; *Crassiseta*, Von Roser, Verh. Wurtt. Dipt. Nachtrag, 1840.

1. *Elachiptera flavida*, n. sp.

♂, ♀. Light reddish colour, the arista black, and the legs more purely yellow. Vertical triangle large, reaching nearly to the root of the antennæ, shining. Head usually a purer yellow than the mesonotum and abdomen. Mesonotum shining. Scutellum trapezoidal, with two moderate-sized bristles on the angles. Abdomen of some specimens brownish, probably from desiccation. Wings hyaline, with a slight yellowish tinge; third section of the costal vein only a little shorter than the second. Length 2-2½ mm.

Ten specimens. St. Vincent.

Hippelates.

Loew, Centur., iii., 67, 1863.

1. Proboscis elongate, folding backwards (*Siphomyia*) . . . 2
   Proboscis not elongate 3
2. Thorax black, thinly greyish dusted. . . *proboscideus*, n. sp.
   Thorax yellow, the mesonotum, except on the sides and behind, black, thickly yellowish dusted . *dorsatus*, n. sp.

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3. Thorax shining black 5
   Thorax not wholly black 4
4. Thorax reddish-yellow; front black; second and third sections of the costal vein of nearly equal length *equalis*, n. sp.
   Mesonotum brown or blackish; front yellow, with a moderate-sized brown triangle; second section of the costal vein much longer than the third *dorsalis*, Loew.
5. Scutellum black; third section of the costal vein much shorter than the second . . . . . *flavipes*, Loew.
   Scutellum reddish; second and third sections of the costa of nearly equal length . . . . . *scutellaris*, n. sp.

1. *Hippelates* (n. subg., *Siphomyia*) *proboscideus*, n. sp.

♂. Front opaque yellow, the vertical triangle black, but covered with light greyish dust, leaving a small, rounded, shining spot near the ocelli. The triangle reaches to about the middle of the front, and its sides are nearly equilateral; a row of small bristles on either side reaches to below the middle of the front. Antennæ, face, cheeks and palpi wholly yellow; on either side of the oral margin in front a small vibrissal bristle. Proboscis slender, elongate, bent near its middle and turned back, its slender proximal portion a little shorter than the length of the head. Cheeks rather broad. Palpi cylindrical, a little broader toward the end. Thorax black, thickly greyish dusted, the mesonotum with three, slender, indistinct lines; the pleuræ shining black on the lower portion. Scutellum oval, with two bristles on its border. Abdomen red or brownish-red; in some specimens reddish-brown with yellowish incisures. Legs wholly light-yellow; spur of the hind tibiæ long and stout. Wings cinereous hyaline; third section of the costa short. Length 2 mm.

Ten specimens. St. Vincent. This and the following species, while agreeing sufficiently well in the other characters with the genus *Hippelates*, I have thought well to distinguish subgenerically from the other species by the name *Siphomyia*, on account of the elongate proboscis. Others of the previously described species evidently belong to the same subdivision.

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2. *Hippelates (Siphomyia) dorsatus*, n. sp.

♀. Front opaque yellow, the minute ocellar spot brownish. Antennæ yellow, the third joint a little brownish in front; arista brown, slender, bare. Face, cheeks, proboscis and palpi yellow; proboscis elongate, the labella slender and turned backward. Mesonotum, except on the sides and posterior margin, black, but largely concealed beneath light-yellow dust; thorax elsewhere yellow, opaque. Scutellum convex, yellow, with two small, approximated bristles at the tip. Abdomen yellow, the second, third and fourth segments with three series of black, subconfluent spots, of which the middle ones extend furthest back. Legs light-yellow; spur of the hind tibiæ very long, curved and black. Wings nearly hyaline; second section of the costal vein nearly twice the length of the third section. Length 2¾ mm.

One specimen. St. Vincent.

3. *Hippelates equalis*, n. sp.

♂, ♀. Front broad; the very large shining black triangle extends to near the root of the antennæ; remainder of the front opaque black. Antennæ, face, and the very narrow cheeks yellow. Occiput black. Thorax light reddish-yellow, the mesonotum shining. Scutellum flattened subquadrate, the marginal bristles remote from each other on the angles. Abdomen reddish-yellow, the distal segments somewhat obscure. Legs wholly light-yellow; spur of the hind tibiæ long, curved and black. Wings greyish hyaline; second and third sections of the costa of nearly equal length. Length 2 mm.

Four specimens. St. Vincent. This species is related to *H. pallidus*, Loew, but will be distinguished by the colour of the front.

4. *Hippelates dorsalis.*

Hippelates dorsalis, Loew, Centur., viii., 75.—Cuba.

♂, ♀. Front broad, light-yellow opaque; vertical triangle reaches to about midway, and is shining black or dark red, sometimes partially concealed beneath greyish dust. Third joint of the antennæ large, rounded; on its upper part black, below yellow The face, the moderately broad cheeks, and the palpi yellow, the proboscis black. Thorax reddish-yellow, the mesonotum black or

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brown, moderately shining and with feebly marked linear stripes. Scutellum reddish-yellowish; oval, convex, and with approximated apical bristles. Abdomen reddish or yellowish at the base, becoming brownish distally. Legs reddish or lutescent yellow, the tarsi brownish distally. Wings nearly hyaline; third section of the costa but little more than half the length of the second section. Length 2 mm.

Four specimens. St. Vincent.

5. *Hippelates flavipes.*

Hippelates flavipes, Loew, Centur., vi., 95.—Cuba.

A large series of specimens from St. Vincent agree with the description of this species so closely that there can be no question of their identity. With them, however, there is yet a larger number which show such discrepancies that their specific identity is somewhat doubtful. I give herewith a description of the variety or species, whichever it may be.

♂, ♀. Front opaque black or dark brown on the sides; on the lower third, from the tip of the very large shining black triangle, opaque yellow. Antennæ yellow, the upper part of the third joint blackish; arista black, bare. Face and cheeks yellow, the former with a large notch in front, which is margined with brown. Mesonotum shining black, with black pubescence; scutellum opaque, convex, and with a pair of approximated bristles at the apex. Pleuræ shining black. Abdomen black; the base, the venter, and the ovipositor yellow or yellowish. Halteres light-yellow. Legs, including the front coxæ, light-yellow; hind femora for the greater part black, the middle femora and hind tibiæ sometimes blackish in the middle. Length 1¾–2 mm.

In yet another large series the legs are almost wholly black, save the tarsi, and the antennæ are wholly black.

6. *Hippelates scutellaris*, n. sp.

♂. Front yellow, including the lower part of the very large, shining black triangle, which reaches very nearly to the base of the antennæ. Antennæ reddish-yellow; the arista black and very finely pubescent. Eyes sparsely, but distinctly, pubescent. Face yellow, somewhat blackish in the middle. Cheeks very narrow. Palpi yellow. Mesonotum wholly shining black, not pollinose.

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Scutellum reddish, blackish at the base, its straight distal margin with two rather remote bristles. Pleuræ reddish-yellow. Abdomen elongate; shining black, at its base obscurely reddish. Legs yellow, the hind tibiæ somewhat, and the last two joints of the tarsi, brown. Wings nearly hyaline; third section of the costa as long as the second section. Length 2¾ mm.

One specimen. St. Vincent.

Oscinis.

Latreille, Nouv. Dict. d'Hist. Nat., xxiv., 196, 1804.

1. Scutellum elongated, triangular, pointed 2
   Scutellum oval, convex 3
2. Scutellum wholly light-yellow; mesonotum black in the middle, yellow on the sides . . . . *triangularis*, n. sp.
   Scutellum black, yellow at the tip; mesonotum wholly black . . . . . *apicalis*, n. sp.
3. Second section of the costal vein not twice the length of the third 6
   Second section of the costal vein fully twice the length of the third 4
4. Antennæ yellow 5
   Antennæ black . . . . . *fur*, n. sp.
5. Mesonotum black, greyish-yellowish dusted . . *incipiens*, n. sp.
   Mesonotum yellow, with four narrow brown stripes, *quadrilineata*, n. sp.
6. Thorax yellow, shining . . . . . *mitis*, n. sp.
   Thorax not shining, yellow 7
7. Thorax shining black, front mostly shining black 8
   Thorax opaque, vittate; front opaque . . . . . *nana*, n. sp.
8. Front tarsi yellow; scutellar bristles approximated, third joint of the antennæ largely yellow . . . *concinna*, n. sp.
   Front tarsi black; antennæ black . . . . . *anonyma*.

1. *Oscinis triangularis*, n. sp. (Pl. XIV., fig. 153*a*, wing.)

♂, ♀. Eyes densely pubescent. Front narrow, not one-third of the width of the head; opaque yellow, a minute black spot at the ocelli; the small frontal triangle shining. Antennæ yellow. Face, the narrow cheeks, the palpi, and the proboscis light-yellow. Thorax light-yellow, with light-yellow hair; mesonotum with three broad, coalesced or coalescent black stripes, the middle one of which extends further forward than the others. Pleuræ with a

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small, round, black spot above the middle coxæ. Scutellum large, nearly equilaterally triangular, with its apex rounded and provided with two approximated bristles; wholly light-yellow. Metanotum and the abdomen, except the immediate base, shining black; venter yellow. Legs yellow; front tibiæ and tarsi brown or brownish; the distal two joints of the hind tarsi in the ♂ black. Wings greyish hyaline; third section of the costa about two-thirds the length of the second section; third and fourth veins parallel. Length 2¼ mm.

Five specimens. St. Vincent, Leeward side, 500–1000 feet.

2. *Oscinis apicalis*, n. sp.

Eyes distinctly pubescent. Front opaque reddish-yellow, the large vertical triangle deep shining black, its anterior point reaching about two-thirds of the distance to the root of the antennæ. Antennæ reddish-yellow, the upper margin of the third joint brownish; arista black, finely pubescent. Face, cheeks, and clypeus black. Palpi reddish-yellow. Mesonotum deep black, moderately shining, finely punctulate. Scutellum elongate, triangular, pointed; black, its apical one-third light-yellow; there are two upright, small bristles at the tip, and on either side a minute tubercle. Pleuræ shining black. Abdomen shining black, the venter yellowish. Halteres nearly white. Legs, not including the coxæ, wholly light-yellow. Wings greyish hyaline; third section of the costa not more than one-half the length of the second section; second, third, and fourth veins parallel. Length 2 mm.

One specimen. St. Vincent. "Forest, 1800 feet, W. slope of Sonfriere, Sept. 23."

3. *Oscinis quadrilineata*, n. sp.

♂, ♀. Eyes pubescent. Front opaque yellow, with a small brown spot between the ocelli; vertical triangle small, but little shining. Antennæ yellow, the third joint brown on its front margin. Face, cheeks, and palpi yellow. Thorax yellow, the mesonotum with four narrow brown stripes, not shining, the median pair more narrowly separated. Scutellum light-yellow. Metanotum and abdomen black, the latter at its immediate base yellow; venter yellow. Legs yellow. Wings nearly hyaline; third section of the costa scarcely one-half the length of the second section. Length 2 mm.

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Four specimens. St. Vincent. The abdomen varies much in colour, from reddish-yellow to black, and the antennæ may be wholly yellow. There are numerous rather short stubbly bristles on the lateral and posterior margins of the mesonotum and on the margin of the scutellum, which are highly characteristic of the species.

4. *Oscinis anonyma*, n. sp.

♂, ♀. Front opaque black on the side, with a large shining black triangle, reaching nearly to the root of the antennæ. Antennæ wholly black, the arista very finely pubescent. Face black; cheeks yellow. Thorax deep shining black. Scutellum convex, black, with two strong, rather remote bristles. Abdomen black, moderately shining. Halteres yellow. Legs yellow, the hind tibiæ in part and all the tarsi brown; the tip of the front tibiæ and their tarsi were blackish. Wings greyish hyaline; second section of the costa slightly longer than the third. Length 1⅛ mm.

Two specimens. St. Vincent.

5. *Oscinis nana*, n. sp.

♂, ♀. Front opaque, black in ground-colour, but covered with a thin brownish dust; the large vertical triangle is somewhat elevated, its sides nearly equilateral, and separated by a distinct groove from the rest of the front; it reaches about midway of the front. Face brown or blackish; cheeks yellowish. Antennæ black, the third joint in large part yellow. Thorax black; the mesonotum with four broad, greyish-yellowish, not conspicuous stripes, leaving three narrow, more blackish intervals. Scutellum black, the bristles of its apex not remote from each other. Pleuræ greyish dusted. Abdomen black, not shining. Legs yellow, the femora for the greatest part, and the last two joints of the tarsi black. Wings nearly hyaline; second and third sections of the costa of nearly equal length. Length 1–1¼ mm.

Four specimens. St. Vincent. The bristles are everywhere short and inconspicuous.

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6. *Oscinis concinna*, n. sp.

♂. The very large, shining black vertical triangle reaches nearly to the root of the antennæ, leaving the sides below opaque-brown. Antennæ reddish-yellow, the front margin of the third joint black; arista pubescent. Eyes distinctly pubescent. Face black in the middle. Cheeks yellow, somewhat silvery. Thorax and scutellum deep shining black, with black hair; bristles of the scutellum approximated. Abdomen shining black. Legs yellow, the femora for the most part pitchy black; front tibiæ in part brown. Wings nearly hyaline; second section of the costa scarcely longer than the third. Length 1¼ mm.

Three specimens. St. Vincent. This species closely resembles *O. anonyma*, but differs in the yellow antennæ, the black femora, the approximated bristles at the tip of the scutellum, the shorter, more slender and yellow front tarsi, and the rather longer second section of the costal vein.

7. *Oscinis mitis*, n. sp.

♂, ♀. Yellow, the head with a minute black spot at the ocelli, and the abdomen for the larger part brown. The very large, shining vertical triangle reaches to the antennæ and nearly from eye to eye at the vertex. Scutellum rather large, subquadrate, the bristles of its apex not approximated. Mesonotum shining, with yellow hairs. Legs lighter yellow. Wings greyish-hyaline; second section of the costa only a little longer than the third; third and fourth veins parallel. Length 2 mm.

Four specimens. St. Vincent, "Windward side."

8. *Oscinis incipiens*, n. sp.

♂, ♀. Front opaque light-yellow, the opaque, whitish-dusted vertical triangle scarcely reaching the middle of the front. Antennæ, face, cheeks and palpi light-yellow, the third joint of the antennæ somewhat brownish above. Thorax and the oval scutellum deep black, but little shining, covered with greyish-yellowish dust or pubescence, the scutellum somewhat yellowish at the apex. Abdomen brownish-black, opaque. Legs yellow, the hind femora, and the hind tibiæ in the middle somewhat brownish. Wings

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nearly hyaline; second section of the costa more than twice the length of the third. Length 1¾ mm.

Thirty specimens. St. Vincent.

9. *Oscinis fur*, n. sp.

♂, ♀. Front light-yellow, opaque, with a V-shaped impressed line, back of which the vertical triangle is more or less black or brown and greyish-dusted. Face, cheeks and palpi yellow. Antennæ black, the basal joints yellow. Thorax black, only a little shining, covered with thin greyish dust or pubescence. Scutellum oval. Abdomen black, moderately shining. Legs black or dark brown, the trochanters, knees, more or less of the anterior tibiæ and the base of the middle tarsi yellow. Wings greyish-hyaline; third section of the costal vein about half the length of the second section. Length 2 mm.

Ten specimens. St. Vincent. This species is closely allied to the foregoing, *O. incipiens*, but differs in the colour of the antennæ and legs, especially.

Chlorops.

Meigen, Illiger's Magazin, ii., 278, 1803.

1. *Chlorops trivittata*, n. sp.

♂, ♀. Front reddish-yellow, mostly shining, with a small black spot between the ocelli. Basal joints of the antennæ yellowish-red; third joint black. The face, the broad cheeks, palpi and broad margins of the occiput yellow. Thorax light-yellow; the broad median black stripe begins at the neck and reaches two-thirds of the way to the scutellum; the lateral stripes begin a little way back of the front margin and reach further toward the scutellum; in addition there is a black strigula above the root of each wing, and a minute black spot on each humerus. Scutellum light-yellow, semicircular in shape. Metanotum black. Abdomen brownish-yellow; venter yellow. Legs yellow; the distal joints of the tarsi brownish. Wings nearly hyaline; the third section of the costal vein only a little more than half the length of the second section; third and fourth longitudinal veins gently divergent; last section of the fifth vein more than twice the length of the penultimate section of the fourth. Length 2 mm.

Fifteen specimens. St. Vincent.

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AGROMYZIDÆ.

Platophrymyia, n. g.

Allied to *Agromyza*, but the front very long, plane, and the epistoma projecting, the proboscis long and slender, folding backward near the middle. Front long, descending, plane or gently concave longitudinally, with moderately strong bristles reaching nearly to the root of the antennæ. Antennæ short, third joint large, rounded, arista bare. Face excavated in profile, short, the epistoma projecting as far forward as the antennal projection; oral margin of cheeks long, horizontal, straight; well developed vibrissal bristles present. Oral margin in front notched. Palpi large, projecting, a little thickened at the extremity. Thorax moderately arched in front, flattened behind, with bristles on the sides and in front of the scutellum. Scutellum large, with four bristles. Abdomen oval, depressed, composed apparently of five visible segments, genitalia not prominent. Legs short and rather strong, not at all bristly. Auxiliary vein rudimentary; first longitudinal vein short; basal cells small but distinct; cross-veins approximated, the posterior one situated before the middle of the wing.

1. *Platophrymyia nigra*, n. sp.

Black. Frontal triangle prominent, with a depression on either side, which extends in the middle in front to the antennæ shallowly. Face with a distinct median keel. Palpi black. Thorax lightly greyish-dusted. Scutellum oval, with four bristles, the median pair decussate. Abdomen pruinose. Halteres yellow. Metatarsi yellowish. Wings whitish-hyaline; penultimate section of the fourth vein about as long as the ultimate section of the fifth vein; the third vein terminates a very little beyond the apex of the wing, and is curved a little toward the fourth vein towards its extremity. Length 2 mm.

One specimen. St. Vincent.

Ophthalmomyia, n. g.

Auxiliary vein feebly distinct at its beginning, continuing as an indistinct line and then uniting with the first vein. First vein short, extending little more than one-third of the length of the wing, with an incision in the costa before its tip. Cross-veins not approximated, the ultimate section of the fourth vein scarcely

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twice the length of the penultimate section; anterior cross-vein situated a little before the termination of the first vein; basal cells small, but complete. Face narrow, feebly carinate on the upper part, broader in the female than in the male, with a row of rather long bristles on each side extending nearly to the antennæ, but without true vibrissæ. The face is plane, not projecting in profile; in the middle, not reaching much more than three-fourths the distance from the root of the antennæ to the lower border of the eyes; epistoma not at all projecting; clypeus projecting lappet-like; cheeks linear, with bristles along the oral margin. Eyes forming nearly the entire head in profile, with a distinct excision on the occipital border near the middle. Occiput concave. Antennæ short, third joint rounded, arista bare. Proboscis slender, when folded enclosed within the oral cavity, the labella slender and turned backward. Legs moderately slender, with bristles on the under side of the femora, but no preapical bristles and no spurs, save on the middle tibiæ. Mesonotum with bristles on the sides and before the scutellum, the latter oval, with four bristles. Abdomen ovate, composed of five segments; ovipositor of female telescopic, cylindrical, when extended about as long as the fifth segment; male genitalia not exserted. Eyes bare. First posterior cell nearly closed.

1. *Ophthalmomyia lacteipennis.* (Pl. XIV., figs. 154, wing; 154*a*, *b*, head of ♂.)

Lobioptera lacteipennis, Loew, Centur., vi., 97.—Cuba.

♂, ♀. Deep shining metallic black; the front and face more opaque; legs brownish-black. Abdomen opaque, somewhat bronze-black, the margins and the fifth segment shining metallic; palpi reddish; wings whitish. Length 2–3 mm.

Numerous specimens.

Ceratomyza.

Schiner, Wien. Ent. Monatschr., vi., 1862; *Odontocera*, Macquart, Hist. Nat. Dipt., ii., 1835 (preoc.).

1. *Ceratomyza dorsalis.* (Pl. XIV., figs. 155, wing; 155*a*, head.)

? *Odontocera dorsalis*, Loew, Centur., iii, 98.—District Columbia.

♂, ♀. Front opaque dusky-yellow, with a rounded black spot about the ocelli. Face and cheeks yellow. First two joints and the under basal portion of the third joint of the antennæ yellow

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the third joint otherwise black. Mesonotum light-yellow, with three broad, opaque black stripes confluent in front, the median stripe reaching but little past the middle; in addition, a slender strigula above the root of each wing. Scutellum blackish on the lateral margins; with two erect bristles at the apex. Pleuræ light-yellow. Metanotum black, except on its uppermost part. Abdomen black, but whitish pruinose; the fifth segment with a yellowish hind margin; venter yellow. Legs yellow; coxæ and femora light-yellow, the tibiæ brown, the tarsi black or blackish. Length 2½ mm.

Two specimens. This species, the only one that has been recognized in the western continent, appears to resemble the European *C. acuticornis*. As in that species, the fourth vein terminates at the extreme tip of the wing, the distance between the two cross-veins is less than half of the length of the last section of the fifth vein. The wings are nearly hyaline.

Agromyza.

Fallen, *Agromyzidæ*, 1823.

1. *Agromyza lateralis*, n. sp. (Pl. XIV., fig. 156, head.)

♂, ♀. Front of equal width throughout, less than one-third the width of the head, wholly light-yellow opaque, except a minute black spot between the ocelli. Antennæ black, the second joint and the third at its base somewhat yellowish. Face and cheeks yellow like the front, the latter narrow, and with a row of small bristles along the oral margin, the anterior one of which forms a moderately stout vibrissa. Palpi black. Occipital orbits yellow, obsolete above. Occiput concave, opaque black. Thorax black; mesonotum moderately shining, the lateral margins light-yellow, broader in front of the wings, and extending over their root, and sometimes including the postalar callosities. The mesonotum has short black hair, and the median rows of bristles extend as far forwards as the middle. Abdomen black, a little shining, clothed with black hair. Halteres light-yellow. Legs black or brownish-black, the tarsi brown or brownish-yellow. Wings hyaline; penultimate section of the fourth vein not longer than the posterior cross-vein; first and second basal cells united. Length 2–3 mm.

Numerous specimens.

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Explanation of Plate XIV.

Fig. 153. *Drosophila* species, wing.
153*a*. *Oscinis triangularis*, wing.
154. *Ophthalmomyia lacteipennis*, wing, 154*a* ♂ head.
155. *Ceratomyza dorsalis*, wing, 155*a* head.
156. *Agromyza lateralis*, head.
157. „ *xanthophora*, wing.
158. „ *innominata*, ♂ head.
159. *Sepsis insularis*, wing, 159*a* ♂ front leg.
160. *Limosina pumila*, wing.
161. „ *perparva*, wing, 161*a* antenna.
162. „ *lugubris*, wing.
163. *Borborus venalicus*, wing.
164. „ *illotus*, wing.
165. *Sphærocera bimaculata*, wing.
166. *Hemerodromia defessa*, wing.
167. *Drapetis apicis*, wing, 167*a* antenna.
168. „ *minuta*, wing, 168*a* antenna.
169. *Phyllomyza magnipalpis*, ♀ head.
170. *Anthomyza cinerea*, ♂ head.

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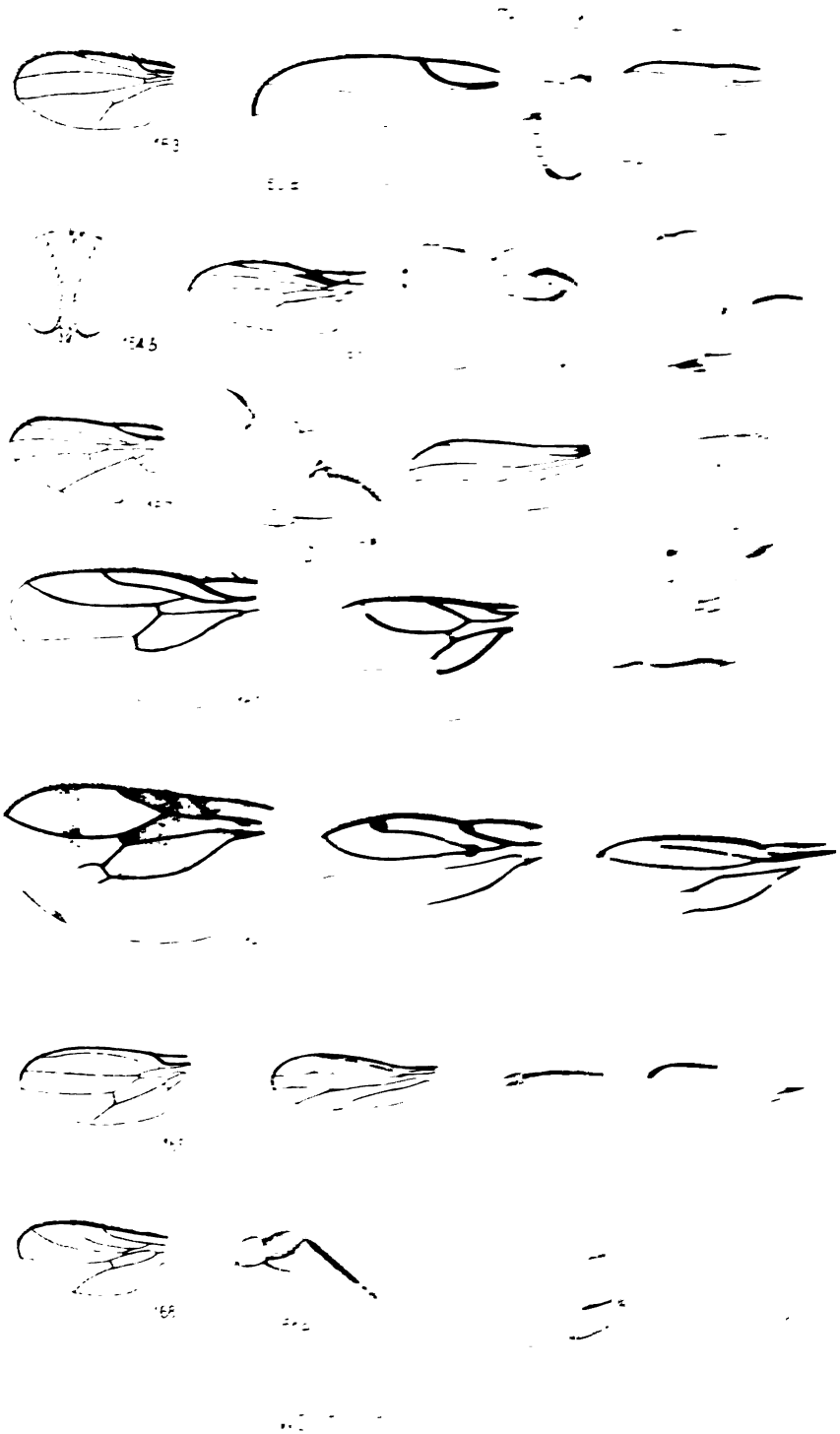

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2. *Agromyza xanthophora.* (Pl. XIV., fig. 157, wing.)

? *Agromyza xanthophora*, Schiner, Reise der Novara, Diptera, 291.—S. America.

♂. Front opaque black, lightly whitish dusted when seen from the side; above about one-third of the width of the head, moderately narrowed below; immediately above the root of the antennæ an oval yellow spot. Antennæ wholly black, the arista bare. Face black, lightly whitish dusted like the front. Cheeks narrow, hairy behind, but apparently without a row of bristles along the oral margin. Cheeks very narrow. Palpi black. Posterior orbits very narrow through it. Mesonotum opaque black, with black hair; the lateral margins, except a small spot on the humeri, the hind margin laterally, and a large confluent, quadrilateral spot behind, sulphur-yellow. Scutellum wholly yellow. Pleuræ black below; on the upper part confluent with the yellow of the sides of the mesonotum; the yellow is broadest below the root of the wings. Abdomen yellow; third, fourth and fifth segments each with a median black spot, partly confluent with each other and becoming successively larger posteriorly. Ovipositor black, cylindrical, gently tapering, about twice as long as broad, and about as long as the fifth segment. Wings hyaline; auxiliary vein distinct, except at its tip, where it is so slender and so closely approximated to the first vein that it is scarcely to be distinguished; penultimate section of the fourth vein scarcely longer than the posterior cross-vein and about half the length of the ultimate section of the fifth vein. Length 4 mm.

One specimen. Schiner's rather brief description applies well to this specimen, except in the size, which is given at 1–1½ lines. I believe, notwithstanding, the species are identical.

3. *Agromyza sorosis*, n. sp.

♂, ♀. Head, including the antennæ, yellow, a minute spot at the ocelli and the upper part of the occiput black. Front about one-third of the width of the head, a little broader on the upper part. Cheeks moderately broad, with bristles along the oral margin. Thorax light-yellow, with three broad, black stripes, separated by linear intervals or wholly confluent; the middle stripe begins at the

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2. *Agromyza xanthogloea.* Pl. XV., fig. 117, wing.

? *Agromyza xanthogloea*, Schiner, Reise der Novara. Diptera, p. —. S. America.

♂. Front opaque black, lightly whitish dusted when seen from the side: above about one-third of the width of the head moderately narrowed below rounded-convex above the root of the antennæ an oval yellow spot. Antennæ wholly black. Face black, lightly whitish dusted like the front. Cheeks narrow, hairy behind, but apparently without a row of bristles along the oral margin. Cheeks very narrow. Palpi black. Posterior orbits very narrow through. Mesonotum opaque black, with black hair; the lateral margins except a small spot on the humeri, the hind margin laterally, and a large confluent quadrilateral spot behind, sulphur-yellow. Scutellum wholly yellow. Pleuræ black below; on the upper part confluent with the yellow of the sides of the mesonotum; the yellow is broadest below the root of the wings. Abdomen yellow: third, fourth and fifth segments each with a median black spot, partly confluent with each other and becoming successively larger posteriorly. Hypopygium black, cylindrical, gently tapering, about twice as long as broad and about as long as the fifth segment. Wings iridescent; auxiliary vein distinct, except at its tip, where it is so slender and so closely approximated to the first vein that it is scarcely to be distinguished. penultimate section of the fourth vein scarcely longer than the posterior cross-vein and about half the length of the ultimate section of the fifth vein. Length 4 mm.

One specimen. Schiner's rather brief description applies well to this specimen, except in the size, which is given at 1–1½ lines. I believe, notwithstanding, the species are identical.

3. *Agromyza varia*, n. sp.

♂, ♀. Head, including the antennæ, yellow, a median spot at the ocelli and the upper part of the occiput black. Front about one-third of the width of the head a little broader in the upper part. Cheeks moderately broad, with bristles along the oral margin. Thorax light-yellow, with three broad black stripes, separated by lin[illegible] wholly confluent; the middle stripe [illegible]

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collar and extends to back of the middle; the lateral portions behind, near the humeri, and reach nearly to the scutellum, with an angular incision at the hind end and at the suture. The scutellum has a small blackish spot on each margin and its dorsum is sometimes brownish. The ovipositor is about as long as broad, and about as long as the fifth segment. Metanotum black. Halteres light yellow. Abdomen yellow, the dorsum brownish or reddish-yellow. Wings hyaline; penultimate section of the fourth vein a little longer than the posterior cross-vein and not more than a fourth or a fifth of the length of the last section of the fifth vein. Length 1¾–2 mm.

Numerous specimens. St. Vincent. There is some variation among the specimens, which possibly may indicate specific differences. ♀. Wings as described; black of the mesonotum extending furthest back in the middle, nearly to the scutellum; abdomen brownish-yellow, the first three segments with a brown cross-band, the last two with a small brown spot in the middle. ♂. Like the typical specimens, but the penultimate section of the fourth vein not one-third the length of the last section of the fifth vein. One of the typical specimens is labelled: "Mt. St. Andreas at Cavalries Forest, 1200 feet, Oct. 16."

4. *Agromyza anthrax*, n. sp.

♂. Black, but little shining. Front very broad, nearly square, its width rather exceeding its length; opaque black, on its lower margin yellowish. Antennæ black, third joint rounded, large, pubescent; arista very short pubescent. Face receding, excavated, not at all visible from the sides; cheeks linear, with black bristles along the oral margin and a rather stout vibrissal bristle in front. Palpi projecting beyond the oral margin, yellow. Mesonotum and scutellum a little shining. Abdomen opaque, oval. Halteres yellow. Knees and tarsi yellow, the distal joints of the latter brownish. Wings lightly tinged; the third vein terminates in the apex of the wing; penultimate section of the fourth vein about one-third as long as the ultimate section of the fifth. Length 1½ mm.

One specimen. St. Vincent.

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LOBIOPTERA.

Wahlberg, Œfvers. af K. Ventenska Acad. Forh., 1847, 259.

1. *Lobioptera leucogastra.*

Milichia leucogastra, Loew, Wien. Entom. Monatschr., v., 43, 20.—Cuba.

Lobioptera leucogastra, Loew, Centur., viii., 95.

A single specimen from St. Vincent, agreeing well with the description.

SEPSIDÆ.

SEPSIS.

Fallen, *Ortalidæ*, 20, 1820.

1. *Sepsis insularis*, n. sp. (Pl. XIV., figs. 159, wing; 159*a*, front leg of ♂.)

♂, ♀. Front shining black, somewhat reddish below, with a median longitudinal depression on the lower part. Antennæ yellowish-red, the third joint sometimes a little brownish; third joint comparatively large. Face and cheeks yellowish-red. Thorax shining black throughout. Abdomen deep shining black, with coppery and purple reflections. Legs yellow or lutescent yellow, the distal joints of all the tarsi and the hind tibiæ brown or blackish; front femora in the male dilated for the basal two-thirds, as far as a bifid tubercle, in which is inserted a short bristle; beyond the tubercle the femur is immediately narrowed, and a little distance before it there is a bristle near the middle of the femur; tibiæ with a small tubercle corresponding to that of the femur. Wings hyaline, the immediate base in the costal cells blackish. Length 4 mm.

Numerous specimens. St. Vincent.

BORBORIDÆ.

LIMOSINA.

Macquart, Hist. Nat. Dipt., ii., 571, 1835.

TABLE OF SPECIES.

1. Third section of the costal vein longer than the second . . 2
   Third section shorter than the second 3
2. Distal section of the second vein distinctly longer than the first section of the third vein . . . . *perparva*, n. sp.

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Distal section of the second vein not longer than the first section of the third vein . . . . . *lugubris*, n. sp.

3. Scutellum deep opaque-black, noticeably different from the mesonotum . . . . . *scutellaris*, n. sp.

Scutellum not noticeably different in colour from the mesonotum 4

4. Third vein beyond the cross-vein nearly straight, terminating at the tip of the wing . . . . . *pumila*, n. sp.

Third vein with a marked anterior curvature, terminating at some distance before the tip of the wing . *dolorosa*, n. sp.

1. *Limosina scutellaris*, n. sp.

♂, ♀. Front black, moderately shining, the lower portion and the face, and the antennæ red. Mesonotum yellowish-red. Scutellum deep velvety black. Abdomen deep black, slightly metallescent, and thinly greyish-pollinose. Legs yellow, hind femora blackish; middle tibiæ with spinous bristles. Length 2-2½ mm.

Numerous specimens. St. Vincent, etc.

2. *Limosina pumila*, n. sp. (Pl. XIV., fig. 160, wing.)

♂, ♀. Front opaque black, a median stripe or slender triangle shining, below red or pitchy. Antennæ black; arista finely pubescent. Face black, obscurely red or pitchy across the middle. Thorax black, moderately shining; scutellum opaque, flattened, with four strong bristles. Abdomen black, but little shining. Legs luteous or brown, the femora and tibiæ more or less blackish, the tarsi for the larger part yellowish; middle tibiæ with strong bristles on the outer side; hind metatarsi but little longer than broad, moderately dilated, scarcely more than half the length of the slender second joint. Wings smoky hyaline; the three sections of the costa of nearly equal length, the first section with longer bristles. Length 2-2½ mm.

Six specimens. St. Vincent.

3. *Limosina dolorosa*, n. sp.

♂, ♀. Black, thinly greyish-dusted, opaque. Antennæ black, arista pubescent; third joint transversely oval. Face and cheeks black, but little shining. Scutellum coloured like mesonotum, its margin reddish. Legs dark-brown; middle tibiæ with stout bristles on the outer side; hind tibiæ and tarsi of nearly equal length, the metatarsi about half the length of the second joint.

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Wings lightly tinged with brownish; first section of the costa with bristles; second section a fourth or a third longer than the third section; the third vein is conspicuously curved forward and terminates distinctly before the tip of the wing; fourth vein beyond the discal cell feebly represented, gently curved. Length 2½–3 mm.

Numerous specimens. St. Vincent.

4. *Limosina perparva*, n. sp. (Pl. XIV., figs. 161, wing; 161*a*, antenna.)

♂. Front and face opaque-black. Antennæ obscurely yellow, the third joint whitish pubescent, heart-shaped, with a terminal arista; arista black, pubescent. Thorax and scutellum deeply black, the former shining, the latter opaque. Abdomen black. Legs black; the tip of the tibiæ and the tarsi yellowish; hind metatarsi nearly as long as the second joint. Wings nearly hyaline; the second vein joins the costa in a very acute angle, and is concave on the posterior side throughout; costa with longer bristles on its first section. Length 0·9 mm.

One specimen.

5. *Limosina lugubris*, n. sp. (Pl. XIV., fig. 162, wing.)

♂, ♀. Face and cheeks yellow or brownish-yellow. Antennæ yellow, the third joint brownish at the tip, whitish pubescent, heart-shaped, the finely-pubescent arista terminal; second joint with a coronet of strong bristles. Front opaque-reddish or brownish-yellow. Thorax, scutellum, and abdomen black shining; scutellum flattened. Legs yellow, middle tibiæ with bristles on the under side. Wings tinged with brownish, with a narrow cross-band and the tip more nearly hyaline; the third vein takes its origin beyond the insertion of the first; the first section of the third vein is a little shorter than the terminal section of the second vein, and the third section of the costa is nearly three times the length of the second section; posterior cross-vein but little longer than the anterior cross-vein. Length 1½ mm.

One specimen. With this specimen there is another, which has the front brown above, the pleuræ brownish-yellow, the wings rather narrower, not clouded, and with the distal section of the third vein more nearly straight, and terminating exactly at the tip of the wing. It undoubtedly belongs to a different species.

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Borborus.

Meigen, Illiger's Mag., ii., 276, 1803.

1. *Borborus venalicus.* (Pl. XIV., fig. 163, wing.)

Borborus venalicus, Osten Sacken, Catalogue of Diptera, 2nd ed., 263. — Africa, Cuba, Brazil (Col. Williston).

♂, ♀. Front deep red, blackish above; opaque, with about ten small silvery spots. Antennæ brownish-red; arista bare. Cheeks and face yellow, the latter shining. Thorax black or nearly black, moderately shining, the dorsum with two pollinose stripes and about twenty small, white-pollinose partially confluent spots. Scutellum large, subtriangular, opaque-black, the base and small spots at the tip white. Abdomen black, the narrow hind-margin of the segments whitish. Femora black or deep brown, with the tip yellowish; tibiæ brown, the front pair with one, the middle and hind pairs with two dark-brown rings. Tarsi yellow, with the two distal joints black and the moderately thickened hind metatarsi partly brown. Wings nearly hyaline, with a small brown cloud at the angulated tip of the second vein and at the origin of the third. Third vein gently curved; front border of the wings without spinous bristles. Length 2–3 mm.

Twelve specimens. "Dr. Loew (*in litt.*) informs me that this is an African species; and as I have found it abundantly in Cuba, it seems probable it was brought over in slave-ships." Sacken, *l. c.* I have the species from Brazil.

2. *Borborus illotus,* n. sp. (Pl. XIV., fig. 164, wing.)

♀. Front opaque-black, on the lower part red. Antennæ red, the third joint rounded; arista finely pubescent. Face reddish-brown. Thorax dark yellowish-red, opaque; mesonotum with abundant and rather long black hair; pleuræ black near the root of the wing. Abdomen opaque-black. Legs brown or brownish-yellow, the femora for the most part blackish; middle and hind tibiæ with stout bristles on the outer side; hind metatarsi moderately dilated, but little more than half the length of the slender second joint. Wings yellowish-hyaline; third section of the costal vein not more than two-thirds the length of the second section;

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second vein sinuous, the third terminates before the tip of the wing; fourth vein thin, but distinct. Length 2½ mm.

One specimen. St. Vincent.

Sphærocera.

Latreille, Hist. Nat. Ins. et Crust., xiv., 1804.

1. *Sphærocera bimaculata*, n. sp. (Pl. XIV., fig. 165, wing.)

♂, ♀. Front and face black, opaque, sometimes in part yellowish, finely roughened. Antennæ brownish-red or reddish-brown, the third joint whitish at the tip; arista bare. Thorax brownish-black, the dorsum slightly shining, with four punctulate lines. Scutellum subtriangular, rounded and convex, bare (a minute point on either margin). Abdomen broadly oval, flat, bare, opaque-black, with two large, yellow spots, the anterior one more rounded or subquadrangular, the posterior one oval and smaller. Venter largely yellow. Legs, including the coxæ, light-yellow, without distinct bristles; front femora thickened; hind legs elongate; hind metatarsi about as long as the three following joints together, much thickened; second joint a little thickened. Wings nearly hyaline; last sections of the third and fourth veins nearly parallel; fifth vein complete. Length 3 mm.

Six specimens. St. Vincent.

PHORIDÆ.*

Phora.

Latreille, Hist. Nat. Crust., etc., xiv., 1804.

1. *Phora fungicola.*

Coquillett, Canadian Entomologist, xxvii., 106, 1895.

One specimen, seemingly a male. 1500 feet. The lower part of the pleuræ is yellowish.

2. *Phora interrupta.*

Zetterstedt, Insecta lapponica, 797, 12, 1840.
Coquillett, Canadian Entomologist, xxvii., 103, 1895.

Eight specimens. Sea level to 1500 feet.

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* By J. M. Aldrich.

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3. *Phora fasciata.*

Fallen, Diptera suecica, Phytomyz., 7, 9, 1823.

Coquillett, Canadian Entomologist, xxvii., 103, 1895.

Fourteen specimens. Sea level to 1500 feet. They are but little different from *Phora interrupta*, but average larger, less dark on abdomen, wings clearer, and first light vein less curved. Both species have the hind femora tipped with brown.

4. *Phora venata*, n. sp.

♂. Head and abdomen black, thorax brownish-black, legs including tarsi yellow, femora a little darker. Palpi brown, antennæ blackish. Legs destitute of setæ, second heavy vein not forked. Anterior frontal bristles proclinate. Bristles of the front small, except the verticals. Halteres brown. Under surface of fore femora with a row of delicate curved hairs. Pleuræ yellowish below. Hypopygium yellow, rather large, with two black projecting claspers below and a brownish lamellar portion, bristly below, projecting backward; also a slender yellow styliform organ (penis ?) in the centre below. Length 1·3 mm.

The most noticeable peculiarity of the species is the venation. The heavy veins reach beyond the middle. The so-called light veins are much heavier than in any other known North American species, comparatively straight, and have the appearance of making a complete union with the heavy veins, instead of stopping a little short and then running parallel with them.

One male. 1000 feet.

5. *Phora furtiva*, n. sp.

♀. Third vein forked, anterior frontal bristles proclinate, tibiæ destitute of large bristles on the outer side; head, thorax and abdomen black, legs brownish, the tarsi and anterior tibiæ yellow. Front black, the bristles rather below medium size, the fine hairs somewhat conspicuous, antennæ blackish, more or less yellowish at base, palpi yellow. Thorax sub-shining, pleuræ shining black, halteres black. Femora in fully coloured specimens dark brown, in less mature ones yellowish-brown, the tibiæ lighter. Hind tarsi almost twice the length of the tibiæ.

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Hind tibiæ on the posterior edge with longer hairs, on the inner side of this a row of about twelve small bristles. Wings slightly yellow, heavy veins reaching but little past the middle, second vein reaching barely more than half-way from the humeral vein to the fork of the third, on the costa. First and second light veins ending about equally far from the apex, the cell before the first as wide as the narrowest part of the one behind it. Length 1·5 mm.

Two females. 1000 feet.

6. *Phora divaricata*, n. sp.

♂, ♀. Antennæ, palpi, pleuræ, halteres and legs deep yellow, anterior frontal setæ reclinate and divaricate; second heavy vein forked, the first attaining three-fourths of the distance from the humeral to the second, the first light vein moderately arcuated, the fourth scarcely visible, very slender. Front dark brown or black, the lower edge yellowish; thorax above varying from yellow to black, frequently yellow with indistinct darker markings longitudinally. Abdomen black or brown, the posterior margin of each segment with a narrow band of light-yellow, which continues more or less as a stripe down the middle of the dorsal surface. Venter yellow. Anterior tibiæ on the front side with a row of four setæ, middle tibiæ with two together a trifle below the knee, hind tibiæ with a minute row of fine hairs down the posterior edge, but no setæ except at apex. Hind femora considerably thickened. Wings tinged with yellow, costa reaching a little past the middle, with two rows of fine setæ, which are more divaricate at the base. The two branches of the second vein are very close together, yet distinct. In the males the genitalia are bent up under the venter, giving the abdomen a knobbed appearance. Length 1·4 to 1·8 mm.

Two males, five females. Sea level to 1000 feet May.

7. *Phora aurea*, n. sp.

♂, ♀. Yellow, lower frontal bristles proclinate, second vein forked, the abdomen, or at least the dorsal part, reddish-orange in colour. Front, antennæ and palpi yellow, arista yellow at base; thorax wholly yellow, halteres yellow, in some cases brownish about the apex; legs wholly yellow, the tarsi scarcely darker, middle and hind tibiæ with a row of nearly a dozen small bristles running

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down the posterior edge; hind femora moderately thickened, with a few little bristles below near the tip; abdomen bright reddish-orange in colour, toward the tip and below irregularly blackened. In one specimen, a male, the reddish colour is confined to the base, and there is a well-defined black spot on each side of the middle of the dorsum. Wings quite deeply tinged with yellow, the heavy veins reaching far beyond the middle, the first light vein but little curved, ending at or but little before the apex. The first heavy vein ends just perceptibly past the middle of the distance between the humeral vein and the tip of the branch of the second vein. The fourth light vein is distinct to the border. Length 1·3 to 1·7 mm.

Two males, seven females. 500 to 1500 feet.

8. *Phora magnipalpis*, n. sp.

♂. Second vein forked, anterior frontal bristles proclinate, legs yellow, the hind femora a little brownish, head, antennæ, thorax, and abdomen black; palpi, halteres and pleuræ brownish-black. The palpi in the male are enlarged, divaricate, destitute of the usual strong setæ. Wings hyaline, the light veins very slender, tip of second vein just midway between the humeral and the fork of the second, on the costa; second light vein with a greater curvature than usual, almost parallel with the vein before it, ending but little behind the apex. The heavy veins reach but little beyond the middle of the wing. Length 1·2 to 1·4 mm.

Four males. Sea level to 1000 feet. May.

I have also four females, same size and locality, which differ in having a lighter but variable coloration. The halteres and palpi vary from yellow to brown; dorsum of thorax brown. The wings are as in the preceding males. I regard them as the same species, although there is not usually such a range of variation, especially between the two sexes.

In addition to the species described above, the collection contained two specimens of somewhat different coloration from any described species, and different from each other, which, on account of the absence of any striking characters, I leave undetermined for the present.

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HIPPOBOSCIDÆ.*

Ornithomyia.

Latreille, Hist. Nat. Crust. et Ins., xiv., 1804.

1. *Ornithomyia erythrocephala.*

? *Ornithomyia erythrocephala,* Leach, Eprob. Ins., 13, pl. xxvii., figs. 4, 5.

Four specimens which probably belong to this species. I have only Wiedemann's quotation of Leach's description for comparison, which does not give the length. The specimens are from nine to ten millimetres in length, the costal border of the submarginal cell is about two-thirds the length of that of the marginal cell, the second posterior cell is only a little longer than the first, etc.

SUPPLEMENT.

EMPIDIDÆ. (See p. 307.)

Hemerodromia.

Meigen, Syst. Beschr., ii., 1822.

1. *Hemerodromia defessa,* n. sp. (Pl. XIV., fig. 166, wing.)

♂. Head and thorax shining, deep pitchy black or black, the lower part of the face and the occipital orbits grey pollinose. Eyes broadly contiguous on the face. Antennæ light yellow, the third joint as long as the first two together. Bristles of thorax and scutellum wholly inconspicuous. Abdomen opaque black, the venter yellow. Legs light-yellow; front femora much thickened, a little longer than the coxa, not emarginate for the reception of the tibial spine. Wings nearly hyaline; anal cell and discal cell wanting; anterior cross-vein situated a little beyond the middle of the basal cell; second posterior cell and its petiole of nearly equal length; no stigma. Proboscis light yellow, shorter than the height of the head.

Four specimens. The present species is related to *H. captus,* Coq., but differs in the shining colour of the head and thorax.

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* By S. W. Williston.

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2. *Hemerodromia*, sp.

♀. Head black, thickly grey pollinose. Eyes narrowly separated in the middle of the face. Antennæ and proboscis light yellow. Thorax reddish yellow, the mesonotum somewhat greyish pollinose, and with feeble indications of longitudinal stripes. Legs light yellow; front femora greatly thickened, and with a distinct emargination for the reception of the tip of the tibiæ. Wings as in *H. defessa*.

One specimen. In the absence of specimens for comparison, it is hazardous to say that this is the same as *H. oratorio*, Fall., but I can find no important differences from Loew's description. I suspect that *H. empiformis*, Say, may also be the same species (Coquillett has wrongly identified it). Coquillett makes no mention of the contiguity of the eye in his *H. rogatoris*, and leaves it to be inferred that the bristles of the thorax are microscopic. If such be the case, the two species are distinct.

For those species of *Hemerodromia*, in the sense of Loew, in which the neuration is normal, Coquillett has recently resuscitated the table name *Mantipeza*, Rondani, referring all the others to *Hemerodromia*, with the exception of *H. scapularis*, Loew, for which he creates the genus *Neoplasta*. *Hemerodromia precatoria*, Fall. (*H. monostigma*, Meigen), is a true *Mantipeza*, in Coquillett's sense, but he leaves it in *Hemerodromia*, so that it is difficult to say just what his conception of *Mantipeza* really is. In the examination of the descriptions and specimens of most of the known species of *Hemerodromia*, in the sense of Loew, I find the following different combinations of characters:—

1. Anal cell present, discal and second posterior cells also present.—*Mantipeza* of Coquillett.

This is *Hemerodromia* of Bigot, and it should be considered that of Meigen also.

2. Anal cell present, second basal cell present, discal cell wanting.—*Mantipeza* of Bigot.

This includes *H. nigriventris*, *H. defecta*, etc. Mr. Coquillett also includes in this group *H. albipes*, Walker. Mr. Coquillett's acumen in the detection of so many of Walker's defectively described species is to be commended. In the present case, however, has he some special information concerning the type of *H. albipes*? Mr. Walker

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located *albipes* with *precatoria*, in which there is a "discoidal areolet," and which should, therefore, belong in Coquillett's *Mantipeza*. He also describes the body as being "fulvo-canis" in colour, with a "slight tawny tinge," while Coquillett calls the "thorax and abdomen black." If Mr. Coquillett has information concerning the type, then Walker's description should be cancelled *in toto*, and the species rest upon Coquillett's diagnosis.

3. Anal cell present, second basal and discal cells united; second posterior cell sessile.—*Neoplasta* of Coquillett.
4. Anal cell wanting; second basal cell present and elongated; discal cell wanting.—*Microdromia* of Bigot.

This includes the species described above, and a number of others.

If Thomson is correct in his reference of *H. analis*, then there is yet another group, differing from *Neoplasta* in the second posterior cell being complete.

Drapetis.

(See page 308.)

Table of Species.

1. Thorax reddish yellow . . . . . *xanthopoda*, Will.
   Thorax black 2
2. Legs light yellow, thorax shining 3
   Legs largely brown; mesonotum moderately shining; first posterior cell not widened at the margin; penultimate section of the fourth vein very short . *apicis*, n. sp.
3. First posterior cell much widened in the margin, the third vein terminating distinctly before the tip of the wing, *minuta*, n. sp.
   First posterior cell narrowed in the margin, the third vein not terminating before the tip 4
4. The extreme tip of the wing is at the tip of the fourth vein, sp.
   The extreme tip is a little before the tip of the fourth vein . . . . . *flavipes*, Will.

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3. *Drapetis apicis*, n. sp. (Pl. XIV., figs. 167, wing; 167*a*, antenna.)

♂, ♀. Front black, of moderate width, narrowed below, not at all shining. Antennæ brown or reddish brown; third joint very small, onion-shaped. Eyes contiguous on the face. Thorax black; mesonotum moderately shining, lightly pruinose in some reflections. Scutellum with two bristles. Abdomen black, nearly opaque; hypopygium shining. Legs brown or blackish brown; front coxæ, basal portion of all the femora, the hind tibiæ in part, and the proximal portion of the four posterior tarsi yellow or yellowish; front femora considerably thickened on the proximal portion, its under border straight; middle femora less thickened, the hind femora rather slender. Wings nearly uniformly tinged with brown; second and third sections of the costa of nearly equal length; third and fourth veins nearly parallel, the third terminating at the extreme tip; penultimate section of the fourth vein about twice the length of the posterior cross-vein. Palpi, proboscis, and halteres brown. Front and hind tibiæ without spurs.

Three specimens.

4. *Drapetis minuta*, n. sp. (Pl. XIV., figs. 168, wing; 168*a*, antenna.)

♂. Eyes closely contiguous above and below the antennæ. Vertical triangle and occiput black, whitish pruinose. Antennæ light yellow; third joint as long as the first two together, a half longer than wide. Thorax black; mesonotum shining, clothed with black hair. Scutellum with two bristles. Abdomen black, moderately shining. Legs light yellow; all the femora moderately thickened, the front pair more so than the others. Wings nearly hyaline; second vein deeply concave anteriorly; third vein widely divergent from the fourth, the first posterior cell widely open.

The hair of the mesonotum in some lights has a yellowish cast. A closely related species from Grenada has the antennæ darker coloured, the third joint smaller, the second vein of the wing less concave, etc. Two specimens.

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5. *Drapetis*, n. sp.

♂. Very much like *D. flavipes*, but smaller, the second longitudinal vein shorter and more concave, the third vein straighter, the fourth terminating at the extreme tip of the wing, instead of a little beyond it, etc. Length 1 mm.

One specimen.

AGROMYZIDÆ. (See p. 426.)

PHYLLOMYZA.

Fallen, Diptera Suec., Ocht., 8, 1823.

1. *Phyllomyza magnipalpis*, n. sp. (Pl. XIV. fig. 169, head of ♀.)

♀. Head deep black. Front broad, large, the narrow orbits, on which are placed the lateral row of bristles, subshining. Third antennal joint very large, the arista, which springs from its superior angle, finely pubescent. Face excavated, retreating in profile. Palpi very large, projecting; proboscis small, rather slender. Thorax deep black; mesonotum shining, with black hair. Scutellum large, trapezoidal, with a stout bristle on each apical angle. Abdomen black, with black hair, not shining; in shape, short ovate, the five segments of nearly equal length. Legs black, the immediate tip of femora, the front tibiæ, the middle tibiæ in part and all the tarsi yellow. Wings nearly hyaline; basal cells small, but complete; submarginal cell narrowed at the extremity, its costal margin only about half the length of that of the first posterior cell; the third vein terminates at the extreme tip of the wing; penultimate section of the fourth vein less than one-third the length of the ultimate section. Length 1½ mm.

One specimen.

AGROMYZA. (See p. 428.)

5. *Agromyza innominata*, n. sp. (Pl. XIV., fig. 158, head of ♂.)

♂. Head yellow, a blackish spot at the ocelli; front broad. Antennæ yellow; third joint longer than broad; arista finely pubescent. Face short, gently excavated in profile; cheeks rather broad. Palpi elongate, dilated. Thorax obscurely reddish-yellow;

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mesonotum with black hairs. Scutellum large, with two stout, remote, black bristles. Abdomen brown or blackish, yellowish at base. Legs light yellow; hind femora black at the immediate tip. Wings cinereous hyaline; basal cells complete; penultimate section of the fourth vein a little longer than the posterior cross-vein, or the last section of the fifth vein. Length 1¼ mm.

One specimen.

GEOMYZIDÆ.

Anthomyza.

Fallen, Spec. Entom., 1810; *Leptomyza*, Macquart, Hist. Nat. Dipt., 1835; *Anthophilina*, Zetterstedt, Ins. Lapp., 1840.

1. *Anthomyza cinerea*, n. sp. (Pl. XIV., fig. 170, head of ♂.)

♂, ♀. Front broad, narrowest opposite the insertion of the antennæ; yellow, the vertical margin more or less cinereous; with four rows of short bristles, reaching nearly to the root of the antennæ. Antennæ yellow, the third joint orbicular and more or less brownish; arista nearly bare. Face and cheeks light yellow. Eyes small, oval. Occiput flattened, cinereous. Thorax black in ground-colour, but thickly covered with grey dust, that on the mesonotum somewhat yellowish; hair of the mesonotum black, bristly, the true bristles, however, confined to the posterior part in the middle. Abdomen black, but more or less thickly whitish pollinose, and with recumbent white hair; first two segments often in part reddish; remaining segments with a more or less distinct yellowish or whitish hind border. Legs yellow, the moderately-thickened femora often infuscated distally; terminal joints of the tarsi more or less brown; bristles on the posterior inferior surface of the front femora not conspicuous. Wings cinereous or smoky hyaline; third section of the costa only a little longer than the fourth; second vein gently curved; penultimate section of the fourth vein only a little longer than the last section of the fifth. Palpi slender, yellow. Length 2¼–2¾ mm.

Twelve specimens. "March. Common on the sandy sea-shore, alighting on the wet, wave-washed sand." The species seems to be allied to *A. gracilis*, Fallen.

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2. *Anthomyza xanthopoda*, n. sp.

♂, ♀. Front narrower than in *A. cinerea*, narrowest below; red, the vertical margin brownish; on either side the vertical margin is white, and bears the outer row of short bristles. Antennæ yellow; arista bare. Face and cheeks light-yellow, the latter scarcely more than one-third as wide as the vertical diameter of the eyes. Thorax black in ground-colour, thickly ashy-grey pollinose, with a shade of yellowish on the mesonotum; hair of the mesonotum bristle-like. Abdomen black, greyish pruinose, opaque; rather slender in the male, the hypopygium protuberant; all the segments with a narrow yellowish or whitish hind border; hair short, wholly black. Legs yellow; last joint of all the tarsi brown; bristles of front femora not conspicuous. Proboscis and wings as in *A. cinerea*. Length 2–2½ mm.

Three specimens. The species is readily distinguishable from *A. cinerea* by the narrower front and cheeks, the less densely pollinose thorax, black hair of the abdomen, &c.

In addition to the foregoing species listed or described from the island of St. Vincent, there are, among the specimens submitted to me, about twenty others, the systematic positions of which are yet more or less doubtful. Several of them will probably require the erection of new genera for their reception. The descriptions will be given in a later paper, in connection with the report upon the Grenada Diptera now in my hands for study

The present collection of Diptera is the first one of any extent that has been studied from the West Indian Islands. Isolated species, or small collections, chiefly of the larger forms, have been studied by various authors, but no collection has ever represented nearly so fully the microfauna as does the present one. The West Indian Diptera-fauna is essentially a common one, with a strong South American facies. Very few of the species, I believe, will be found restricted to any single island or group of islands. But comparatively few of the species will be found to occur in North America, and they for the most part are either species of wide-spread habitats, or else are confined to

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the southernmost portions of the United States, especially Florida, whose fauna seems to partake largely of the southern type.

It may, perhaps, occasion some surprise that so large a proportion of the foregoing species are determined as new. This is due to two facts. First, the larger portion of the species of the collection are small or very small, the majority not exceeding four millimetres in length and nearly a half requiring the use of a compound microscope for their study. Second, the small, obscure species are exceedingly difficult to recognize from the majority of the existing descriptions of South American forms. I cannot hope to have avoided all synonyms. That some of the species have been previously described from South and Central America will be a matter of comparative indifference if I have succeeded in so describing and figuring the present ones that the future observer of specimens from these regions will be able to determine them with tolerable certainty.

My thanks are due to Professor Aldrich for so kindly undertaking the study of the families Dolichopodidæ and Phoridæ, to which he has given so much attention in recent years.

Explanation of Plates VIII., IX., X., XI., XII., XIII., & XIV.

Plate VIII.—See explanation facing Plate VIII.				
Plate IX.	„	„	„	Plate IX.
Plate X.	„	„	„	Plate X.
Plate XI.	„	„	„	Plate XI.
Plate XII.	„	„	„	Plate XII.
Plate XIII.	„	„	„	Plate XIII.
Plate XIV.	„	„	„	Plate XIV.

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XII. *Supplementary Note to my previous Papers on the* Heteromerous Coleoptera *of Australia and Tasmania.* By George Charles Champion, F.Z.S.

[Read June 4th, 1896.]

Since the publication of Part II. of my paper on the "Heteromerous Coleoptera of Australia and Tasmania" (Trans. Ent. Soc. Lond., 1895), two memoirs dealing with the same subject have come to hand. Both are by Mr. A. M. Lea, of the Bureau of Agriculture, Perth, W. Australia. As a question of priority is involved in several cases amongst the Anthicidæ and Mordellidæ, it may be stated that Mr. Lea's papers bear the following dates:—The first [Proc. Linn. Soc. N.S.W. (2) ix., pp. 589–634] was read on Oct. 31st, 1894, and published on March 28th, 1895. The second [Proc. Linn. Soc. N.S.W. (2) x., pp. 224–319] was read on May 29th, 1895, and published on Nov. 18th, 1895.

His first paper, therefore, antedates my own by a little more than two months, the latter having been read in March, and published in June, 1895. The second was not issued till more than five months later. Mr. Lea has been kind enough to send me specimens of many of his new species of Anthicidæ and Mordellidæ, and also to let me see authentically named examples of several of the species of King and Macleay which were not recognizable from the brief descriptions. The Rev. T. Blackburn, too, has sent me a specimen of his genus *Trichosalpingus* for examination.

The following corrections must be made to my paper:—

P. 233. The Tasmanian insect described by me under the name of *Talayra orchesioides* = *Orchesia elongata*, Macl. (from Queensland, etc.), according to specimens sent me by Mr. Lea. The species will therefore have to bear the name *Talayra elongata*.

P. 236. The genus *Tellias* = *Trichosalpingus*, Blackburn (1891), who, the lamellate penultimate tarsal joint notwithstanding, referred it to the Pythidæ, where I should not have thought of looking for it. One of the principal characters given by Lacordaire and others for the Pythidæ is the "simple

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tarsi." *T. fumatus*, Champ., is very closely allied to *T. brunneus*, for a specimen of which I am indebted to Mr. Blackburn, but may be separated from it by the coarser and less dense puncturing of the thorax and elytra.

Pp. 244, 245. The citations *Sessinia atkinsoni* and *S. sublineata*, C. O. Waterh., "in litt." should read "Cist. Ent. ii., pp. 228, 229 (1877)." These species have not been noticed in the Zoological Record, and as Mr. Waterhouse could not give me any information on the subject, when applied to, and I was unable to find them at the time, they were cited as unpublished names.

P. 257. The name *inflatus* is preoccupied in *Anthicus*. This species is described by Mr. Lea in his second paper (p. 279), and his name, *ovipennis*, can therefore be substituted.

P. 262. *Anthicus walkeri*. According to specimens received from Mr. Lea, this insect = *Formicomus australis*, King. The species is obviously an *Anthicus*. It appears to be a common and widely distributed Australian species.

P. 263. *Anthicus australis*. Mr. Lea informs me that this insect certainly = *A. rarus*, King (= *propinquus*, Macl.), and that the species is moderately common in Northern New South Wales and Southern Queensland. I am indebted to Mr. Lea for a specimen of *A. rarus*.

P. 266. *Micranthicus brachypterus* = *Anthicus pulcher*, King, according to specimens sent by Mr. Lea for comparison. The species must therefore bear the name *Micranthicus pulcher*.

The following species (and probably others) named by Mr. Lea in his second paper, were described by myself, and his names cannot stand:—

Orchesia saltatoria, Lea = *O. austrina*, Champ.
Anthicus triangularis, Lea = *A. excavatus*, Champ., var.
„ *delicatulus*, Lea = *A. paululus*, Champ.
Mordella fasciata, Lea = *M. graphiptera*, Champ.
„ *uniformis*, Lea = *M. pygmæa*, Champ.
„ *distincta*, Lea = *M. fulvonotata*, Champ.
„ *setipes*, Lea, is a *Mordellistena*, and = *austrina*, Champ.

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I may also note that *Mordella aterrima* (Macl.), Lea, is a *Tomoxia*.

In Part I. of my paper on this subject (Trans. Ent. Soc. Lond., 1894, pp. 389, 390) *Platynotus insularis*, Hope, is cited as being possibly synonymous with *Hypaulax iridescens*, Blackb. This surmise proves to have been correct, as Hope's type has now been found, and through the kindness of Prof. Poulton I have been able to examine it.

30TH SEPTEMBER, 1896.

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XIII. *On the classification of three subfamilies of Moths of the family* Pyralidæ: *the* Epipaschiinæ, Endotrichinæ, *and* Pyralinæ. By Sir George F. Hampson, Bart., B.A.

[Read April 1st, 1896.]

The three subfamilies of *Pyralidæ*, the *Epipaschiinæ*, *Endotrichinæ*, and *Pyralinæ*, of which a classification is here attempted, all belong to the group of *Pyralidæ* which have the median nervure of the hindwing non-pectinate on upperside, and vein 7 of the forewing stalked with 8, 9.

The *Epipaschiinæ*, which are the ancestors of the subfamily *Phycitinæ*, are to be distinguished from the allied subfamilies by having small tufts of raised scales on the forewing below the cell and on the discocellulars; the proboscis is fully developed, and vein 8 of the hindwing is either free or anastomoses with 7, whilst a large proportion of the species have in the male sex a more or less developed thickly-scaled corneous process projecting backwards from the basal joint of the antennæ over the thorax.

The *Endotrichinæ* and *Pyralinæ* have the forewing smoothly scaled, the former has vein 8 of the hindwing anastomosing with 7, whilst in the latter it is free.

The *Endotrichinæ* may be distinguished from the *Chrysauginæ* by the former having the maxillary palpi developed, whilst in the latter, which are almost confined to the tropical and warmer temperate parts of America, though a few species have spread into the Australian and Malayan regions, the maxillary palpi are aborted. Finally in the *Pyralinæ*, the genera that have the proboscis aborted may be distinguished from the few *Schœnobiinæ* that have vein 7 of the forewing stalked with 8, 9, by vein 8 of the hindwing being free.

The three subfamilies thus represent a branch of the

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Pyralidæ which has become differentiated from the primitive stock, represented by the more generalised *Pyraustinæ*, by vein 7 of the forewing having become stalked with 8, 9. Of the three the most generalised is the *Pyralinæ*, giving rise on the one hand to the *Endotrichinæ* from which arose the *Chrysauginæ*, and on the other hand the *Epipaschiinæ* from which have sprung the *Phycitinæ* and *Anerastiinæ*.

An excellent revision of the *Pyralinæ* of the Palæarctic fauna, including the other two subfamilies here dealt with, was published by Mr. E. Meyrick in our Transactions for 1890, they are, however, few in number compared with the tropical forms; the genus *Acropentias*, Meyr., which he includes amongst them I regard as belonging to the *Schœnobiinæ*. A very valuable essay on the classification of the *Pyralinæ*, *Endotrichinæ*, and *Chrysauginæ* was published in the Annales de la Société Entomologique de France* by the late M. E. M. Ragonot, with most accurate and minute diagnoses of most of the genera, but such a large number of species were either unknown or very imperfectly known to him that it cannot be regarded as more than the preliminary essay which he himself considered it. In it he defined the *Endotrichinæ* as differing from the *Chrysauginæ* in being slenderly built insects, and includes in them some American genera which on the definition by the maxillary palpi which I have adopted I consider as belonging to the *Chrysauginæ*.

In the phylogeny of the subfamilies, as given in the family trees, the genera should rarely be considered to be directly derived from those placed as their ancestors as at present constituted, and much less so from any existing species of those genera, for in the large majority of cases they are derived from more generalised ancestral forms which would come within or almost within the definitions of those genera.

Species which I have examined, but which are not in the British Museum collection, are marked with an (*), species of which the types are in the Museum with a (†), whilst described species of which the classification is uncertain are placed at the end of each genus.

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* Ann. Ent. Soc. Fr., 1890, pp. 435-546; and 1891, pp. 15-114 & 559-662, plates 5, 7, 8, & 16.

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I have to thank the Hon. Walter Rothschild for the loan of types from the Felder collection, and species described by Mr. Warren in his collection; Prof. Poulton, F.R.S., for types from the Oxford University Museum; Mr. E. Meyrick, for the loan of Australasian types; Mr. J. H. Leech, for the loan of Japanese and Chinese types; and especially Mr. H. J. Elwes, for the gift to the British Museum of the types of all the species from the Malayan subregion described by Mr. Meyrick in our Transactions for 1894.

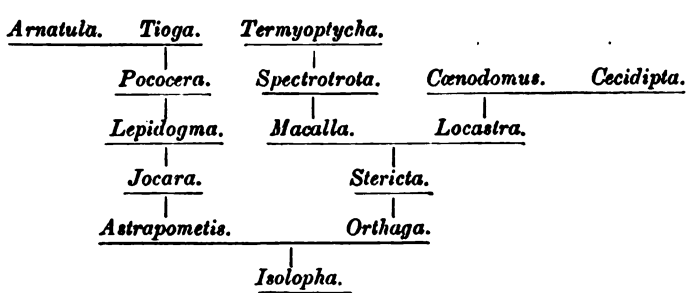
I have also to thank Mr. W. T. Blanford, F.R.S., for obtaining permission for me from the India Office to reproduce 45 figures of moths lately published in the fourth volume of the Moths of the Fauna of India series.

Subfamily Epipaschiinæ.

Proboscis present; palpi almost always upturned, and in male often with the 2nd joint hollowed out to receive the brush-like maxillary palpi which are sometimes bilobed; antennæ of male usually with a more or less developed flagellate thickly scaled process from basal joints extending backwards over the thorax. Forewing with tufts of raised scales below the cell and on discocellulars; veins 7, 8, 9 stalked. Hindwing with the median nervure not pectinate; vein 8 usually free.

The larvæ of several species live in colonies in webs and form social cocoons.

Phylogeny of the Epipaschiinæ.



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Key to the Genera.

A. Palpi upturned—
a Hindwing with vein 7 anastomosing with 8.
a^1 Hindwing with vein 4, 5 stalked.
a^2 Forewing with vein 6 from cell.
a^3 Forewing with vein 10 stalked with 7, 8, 9 . . . . . 3. *Pococera.*
b^3 Forewing with vein 10 from the cell. 1. *Arnatula.*
b^2 Forewing with vein 6 stalked with 7, 8, 9 . . . . . 2. *Tioga.*
b^1 Hindwing with veins 4, 5 approximated for about half their length . . . . . 4. *Lepidogma.*
c^1 Hindwing with veins 4, 5 radiating from angle of cell . . . . . .
a^2 Palpi reaching well above vertex of head. 5. *Jocara.*
b^2 Palpi reaching vertex of head . . . 6. *Astrapometis.*
b Hindwing with vein 8 free.
a^1 Forewing with veins 4, 5 stalked.
a^2 Forewing with vein 10 anastomosing with 8, 9. Hindwing with veins 4, 5 stalked. . . . . 7. *Termioptycha.*
b^2 Forewing with vein 10 free; hindwing with veins 4, 5 from cell . . . 8. *Spectratrota.*
b^1 Fore and hindwings with veins 4, 5 appproximated for about one-third length . . 9. *Macalla.*
c^1 Fore and hindwings with veins 4, 5 radiating from angle of cell.
a^2 Forewing with vein 10 free.
a^3 Palpi with the second joint reaching well above vertex of head . . 13. *Stericta.*
b^3 Palpi with the second joint hardly reaching vertex of head.
a^4 Forewing without antemedial ridge of hair; antennæ of male non-pectinate.
a^5 Tibiæ nearly smoothly scaled 14. *Orthaga.*
b^5 Tibiæ fringed with long hair 12. *Locastra.*
b^4 Forewing with antemedial ridge of hair; antennæ of male pectinate . . . . 10. *Cænodomus.*
b^2 Forewing with vein 10 stalked with 7, 8, 9; antennæ of male pectinate . . 11. *Cecidipta.*
B. Palpi porrect . . . . . 15. *Isolopha.*

Genus Arnatula.

Arnatula, Staud., Iris., vi., p. 78 (1893).
Parorthaga, Hmpsn., Moths of India, vol. iv., p. 111 (1896).

Palpi upturned, the 2nd joint reaching vertex of head, the 3rd well developed, maxillary palpi filiform; frons rounded; antennæ of male fasciculate; tibiæ slightly hairy. Forewing with vein 3

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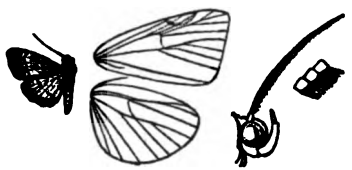
approximated for a short distance to 4, 5 which are stalked ; 6 from upper angle ; 7, 8, 9 stalked ; 10, 11 free; male with a glandular



Arnatula melanophia, ♂, $\frac{1}{1}$ (from Moths Ind., vol. iv.).

swelling on costa beyond middle. Hindwing with vein 3 from angle of cell ; 4, 5 stalked ; 6, 7 from upper angle, 7 anastomosing with 8.

Sect. I. Antennæ of male with short thickly scaled process from basal joint :—

(1). *ARNATULA CAPNOPIS, Meyr., Trans. Ent. Soc., 1885, p. 439 . . . . . Australia.

(2). *ARNATULA ELASSOTA, Meyr., Trans. Ent. Soc., 1884, p. 280 . . . . . Australia.

Sect. II. Antennæ of male with no process from basal joint :—

Type. (3). ARNATULA MELANOPHIA, Staud., Iris., v., pl. iii., fig. 22, & vi. p. 78 . . . Siberia, Japan, Bhután, Ceylon, Sambawa.
†*Parorthaga euryptera*, Meyr., Trans. Ent. Soc., 1894, p. 476.

(4). °ARNATULA TORNOTIS, Meyr., Trans. Ent. Soc., 1887, p. 183 . . . . . Queensland.

Genus TIOGA.

Tioga, Hulst., Ent. Am., iv., p. 113 (1888).
Tallula, Hulst., Ent. Am., iv., p. 114.
Oneida, Hulst., Ent. Am., v., p. 63 (1889).

Palpi upturned and reaching well above vertex of head ; maxillary palpi filiform ; antennæ fasciculate ; tibiæ slightly hairy.

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Forewing with vein 3 from angle of cell ; 4, 5 approximated for half their length. 6, 7, 8, 9 stalked ; 10, 11 free. Hindwing with

Tioga atrifascialis, ♂, ½.

vein 3 from angle of cell ; 4, 5 stalked ; 6, 7 stalked ; 7 anastomosing with 8.

TIOGA ATRIFASCIALIS, Hulst., Trans. Am. Ent. Soc., xiii., p. 160 . . . . . U. S. A.

Auctorum.

Oneida lunulalis, Hulst., Ent. Am., iii., p. 130, and v., p. 64 . . . . . U. S. A.

Type. *Tioga aplastella*, Hulst., Ent. Am., iv., p. 113 . U. S. A.

Genus POCOCERA.

Pococera, Zell., Iris., 1848, p. 874.
Tetralopha, Zell., Iris., 1848, p. 879.
Lanthaphe, Clem., Proc. Acad. Nat. Sci. Phil., 1860, p. 207.
Benta, Wlk., xxvii., p. 112 (1863).
Auradisa, Wlk., xxxiv., p. 1504 (1865).
Hemimatia, Led., Wien Ent. Mon., 1863, p. 347.
Phidotricha, Rag., Ann. Ent. Soc. Fr., 1888, p. 139.
Katona, Hulst., Ent. Am., iv., p. 113 (1888).
Saluda, Hulst., Ent. Am., iv., p. 113.
Loma, Hulst., Ent. Am., iv., p. 114.
Wanda, Hulst., Ent. Am., iv., p. 114.
Attacapa, Hulst., Ent. Am., v., p. 71 (1888).

Palpi upturned, the 2nd joint reaching just above vertex of head, the 3rd short ; maxillary palpi filiform ; antennæ of male

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fasciculate; tibiæ smoothly scaled. Forewing with veins 7, 8, 9, 10 stalked; 11 free. Hindwing with the lower angle of cell

Pococera militella, ♂, ½.

produced; vein 3 from angle; 4, 5 stalked; 6, 7 from upper angle; 7 anastomosing with 8.

Sect. I. Antennæ of male with a more or less strongly developed process from basal joint; a deep furrow in cell of forewing above.

A. Forewing with veins 4, 5 from cell.

a. (*Tetralopha*). Forewing of male with a fringe of large scales on basal half of costa below.

(1). POCOCERA MILITELLA, Zell., Iris., 1848, p. 880 . . . . . U. S. A.

(2). POCOCERA ROBUSTELLA, Zell., Iris., 1848, p. 881 . . . . . U. S. A.

†*Tetralopha diluculella*, Grote, N. Am. Ent., i., p. 60.

Toripalpus talleolalis, Hulst., Tr. Am. Ent. Soc., xiii., p. 160.

(3). †POCOCERA SUBCANALIS, Wlk., xxvii., p. 56. U. S. A.

(4). POCOCERA ASPERATELLA, Clem., Proc. Ac. N. Sc. Phil., 1862, p. 207 . . . Canada, U. S. A.

†*Benta expandens*, Wlk., xxvii., p. 112.

(5). POCOCERA MELANOGRAMMOS, Zell., Verh., Z.B. Wien, 1872, p. 546, pl. 3, fig. 24 . U. S. A.

(6). POCOCERA SCORTEALIS, Led., Wien Ent. Mon., 1863, p. 347, pl. 7, fig. 12 . . Texas, Colombia.

b. (*Auradisa*). Forewing of male with no fringe of scales on costa below.

(7). †POCOCERA GELIDALIS, Wlk., xxxiv., p. 1505 Honduras.

†*Myelois subalbella*, Wlk., xxxv., p. 1714.

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B. (*Wanda*). Forewing with veins 4, 5 stalked.

(8). POCOCERA HUMERELLA, Rag., Ann. Ent. Soc. Fr., 1888, cli. . . . . U. S. A.

Sect. II. (*Pococera*).—Antennæ of male with no process from basal joint; forewing with no furrow; veins 4, 5 stalked.

(9). POCOCERA ATRAMENTALIS, Led., Wien Ent. Mon., 1863, p. 347, pl. 7, fig. 11 . . S. America.

Tetralopha scabridella, Rag., Ann. Ent. Soc. Fr., 1888, p. cxxxviii.

Phidotricha erigens, Rag., Ann. Ent. Soc. Fr., 1888, p. cxxxix.

(10). POCOCERA VARIELLA, Rag., Ann. Ent. Soc. Fr., 1888, cli . . . . . U. S. A.

Type. (11). *POCOCERA GIBBELLA, Zell., Iris., 1848, p. 874 . . . . . Brazil.

(12). †POCOCERA ALBULELLA, n. sp.

♀. Head and thorax grey and fuscous; abdomen pale ochreous irrorated with fuscous. Forewing grey irrorated with fuscous; a large blackish triangular patch on costa before middle with a tuft of black and white scales at its apex; traces of a medial line bent inwards to costa, the area beyond it with a rufous tinge; a diffused postmedial black line excurved and waved between veins 7 and 3; a diffused apical black patch; a marginal series of black specks. Hindwing pale yellowish; the apical area suffused with fuscous; cilia white with a fuscous line through them.

Hab. Espiritu Santo, Brazil. *Exp.* 22 mm.

(13). †POCOCERA MELANOLEUCA, n. sp.

♀. Head, thorax and abdomen black and white; collar tinged with olive. Forewing with the base black, then a white band followed by a black-edged olive band blackish at costa; a white medial band with black discocellular spot and patch on costa; a waved postmedial black line with diffused olive and black beyond it becoming grey at margin with a white costal spot at the postmedial line and another on outer margin below apex; cilia intersected with black. Hindwing fuscous with a black submarginal spot on vein 2; the cilia black at base.

Hab. Columbia. *Exp.* 22 mm.

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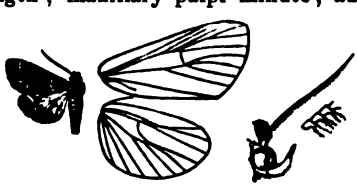
Auctorum.

Tetralopha insularella, Rag., Ann. Soc. Ent. Fr., 1888, p. 138	Porto Rico.
,, *insularella*, Moeschl., Abh. Senck. Ges., xvi., 325	Porto Rico.
,, *fuscolotella*, Rag., Ann. Soc. Ent. Fr., 1888, p. 151	Arizona.
,, *nephelotella*, Hulst., Ent. Am., iv., 114	U. S. A.
,, *baptisiella*, Fern., Ent. Am., iii., 128 .	U. S. A.
,, *tiltella*, Hulst., Ent. Am., iv., 114 .	U. S. A.
Attacapa callipeplella, Hulst., Ent. Am., iv., 114.	U. S. A.
Tetralopha euphemella, Hulst., Ent. Am., iv., 114.	U. S. A.
Hemimatia rigualis, Led., Wien Ent. Mon., 1863, p. 347, pl. 7, fig. 13	Venezuela.
,, *phryganidalis*, Pag., Jahrb. Nass. Ver., xxxix., 174	Aru.
,, *scalpellalis*, Pag., Jahrb. Nass. Ver., xxxix., 173	Aru.
,, *claudulis*, Moesch., Abh. Senck. Ges., xiv., 75	Jamaica.
Pococera melunographella, Rag., Bull. Soc. Ent. Fr., 1888, p. 152	U. S. A.
,, *texanella*, Rag., Bull. Soc. Ent. Fr., 1888, p. 152	U. S. A.
Lanthaphe platanella, Clem., P. Ac. N. Soc. Phil., 1862, p. 207	U. S. A.

Genus Lepidogma.

Lepidogma, Meyr., Trans. Ent. Soc., 1890, p. 472.
Asopina, Christ., Stett. Ent. Zeit., 1894, p. 36.

Palpi upturned, the 2nd joint reaching vertex of head, the 3rd of moderate length; maxillary palpi minute; antennæ of male



Lepidogma obatralis, ♂, ½ (from Moths Ind., vol. iv.).

fasciculate; mid and hind tibiæ with the outer terminal spur short. Forewing narrow; the costa straight; vein 3 from angle of cell;

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4, 5 approximated for one-third length, or stalked ; 7, 8 stalked ; 10, 11 free. Hindwing with vein 3 from before angle of cell ; 4, 5 approximated for half their length ; 6, 7 on a short stalk, 7 anastomosing with 8.

Sect. I. Antennæ of male with a large tuft of scales from apex of basal joint.

A. Forewing with vein 9 given off from 8.

Type. (1). LEPIDOGMA TAMARICALIS, Mann., Verh. Z.B. Wien, xxii., 124 . . . . . S. Europe.

(2). †LEPIDOGMA RUFESCENS, Hmpsn., Moths of India, vol. iv., p. 113 (♀) . . . Bhután.

B. Forewing with vein 9 coincident with 8.

(3). LEPIDOGMA OBATRALIS, Christ., Hor. Ent. Ross., 1876, xii., p. 264, pl. 7, fig. 36.
†*Hypotia rafifera*, Swinh., P. Z. S., 1884, p. 523, pl. 48, fig 8 . . . . . Central Asia, N.-W. India.

Sect. II. Antennæ of male with no tuft on basal joint; forewing with veins 4, 5 stalked, 7 from 8 after 9.

(4). †LEPIDOGMA OLIVALIS, Swinh., A. M. N. H. (6), xvi., p. 301 . . . . . W. India.
Ulotrichodes novalis, Warr., A. M N. H. (6), xvii., p. 463 . . . . . W. India.

Genus JOCARA.

Jocara, Wlk., xxvii., p. 115 (1863).
Toripalpus, Grote, Pr. Bost. Soc. Nat. Hist., xix., 265 (1877).
Titanoceros, Meyr., Trans. Ent. Soc., 1884, p. 62.

Palpi upturned, reaching well above vertex of head and hollowed out to receive the bifurcate brush-like maxillary palpi ; antennæ of male fasciculate with a thickly scaled basal process extending

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to collar; tibiæ nearly smooth. Forewing with veins 3, 4, 5 well separated at origin; 6 from upper angle; 7, 8, 9 stalked; 10, 11

Jocara breviornatalis, ♂, ½.

free. Hindwing with vein 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle, 7 anastomosing with 8.

(1). †JOCARA BREVIORNATALIS, Grote, Proc. Bost. Soc. N. H., xix., 265 . . . . U. S. A.
(2). †JOCARA TRABALIS, Grote, Pap., i., 18 . . U. S. A.
Type. (3). †JOCARA FRAGILIS, Wlk., xxvii., 115 (♀) . St. Domingo.
(4). †JOCARA MONOSEMIA, Zell., Hor. Ent. Ross., xvi., 203, pl. xi., fig. 23 . . . . Brazil.
(5). JOCARA CATAXANTHA, Meyr., Trans. Ent. Soc., 1884, p. 63 . . . . . Australia.

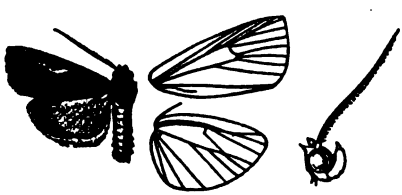
Auctorum.

Toripalpus incrustalis, Hulst., Ent. Am., iii., 130. U. S. A.

Genus ASTRAPOMETIS.

Astrapometis, Meyr., Trans. Ent. Soc., 1884, p. 67.

Palpi upturned reaching vertex of head; maxillary palpi filiform; antennæ of male fasciculate with short process from basal joint; tibiæ nearly smooth. Forewing with veins 3, 4, 5 well



Astrapometis saburalis, ♂, ½.

separated at origin; 6 from upper angle; 7, 8, 9 stalked; 10, 11 free. Hindwing with vein 3 from well before the angle of cell; 4, 5 from angle; 6, 7 stalked, 7 anastomosing with 8.

Type. †ASTRAPOMETIS SABURALIS, Wlk., xix., 914 . Australia.

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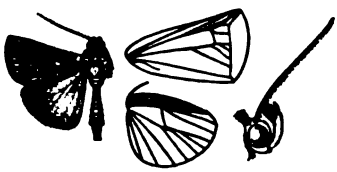
Genus Termioptycha.

Termioptycha, Meyr., Trans. Ent. Soc., 1889, p. 504.

Palpi upturned, the 2nd joint reaching well above vertex of head and with a large tuft of scales on inner side at extremity, 3rd joint well developed; maxillary palpi filiform; antennæ fasciculate with paired tufts of scales behind them; legs with the tibiæ moderately hairy; palagia with rough scales and hair; pectus with ridges of large scales; abdomen with lateral tufts at extremity.



Termioptycha cyanopa, ♂, ½.

Forewing of male with the outer margin broadly folded over below; the cell roughly scaled; vein 3 from before angle of cell; 4, 5 shortly stalked; 6 from upper angle and curved; 7, 8, 9 stalked, and 10 slightly anastomosing with them to form an areole. Hindwing of male very roughly scaled below and with a dense fringe of short hair recumbent on costa; vein 3 approximated to 4, 5, which are stalked; 6, 7 from upper angle; 8 free.

Type. *Termioptycha cyanopa, Meyr., Trans. Ent. Soc., 1894, p. 505 . . . . . New Guinea.

Genus Spectratrota.

Spectratrota, Warr., A. M. N. H. (6), vii., 426 (1891).

Palpi upturned, reaching above vertex of head, the 3rd joint tufted with hair; maxillary palpi filiform; antennæ of male

Spectratrota fimbrialis, ♂, ½.

ciliated, the basal joint dilated with scales; mid and hind tibiæ with tufts of spinous hair on outer side at base and extremity.

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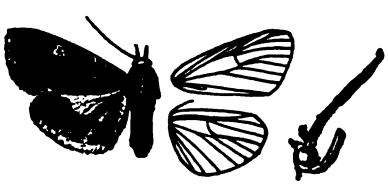
Forewing of male with a large fovea on upper side at upper angle of cell above vein 6 which is bent downwards; a subbasal tuft of hair on vein 1; veins 3, 4, 5 stalked in male, 3 from angle of cell in female; 7, 8, 9 stalked; 10, 11 free. Hindwing of male with a large tuft of hair at base of inner margin; the lower angle of cell produced; vein 3 from before angle; 4, 5 from angle; 6, 7 stalked; 8 free.

Type. †SPECTRATROTA FIMBRIALIS, Warr., A. M. N. H. (6), vii., p. 427 . . . . . Australia.

Genus MACALLA.

Macalla, Wlk., xvi., 155 (1858).
Lamida, Wlk., xvi., 252.
Epipaschia, Clem., Proc. Nat. Sci. Phil., 1860, p. 14.
Salma, Wlk., xxvii., 107 (1863).
Allata, Wlk., xxvii., 110.
Exacosmia, Wlk., xxxii., 609 (1865).
Calinipaxa, Wlk., xxxiv., 1218 (1865).
Aradrapha, Wlk., xxxiv., 1257.
Mochlocera, Grote, Can. Ent., viii., 151 (1876).
Telephasa, Moore, Lep. Atk., 200 (1888).
Parasarama, Warr., A. M. N. H. (6), vi., 474 (1890).
Orthotrichophora, Warr., A. M. N. H. (6), vii., 429 (1891).
Pseudolocastra, Warr., A. M. N. H. (6), vii., p. 249.

Palpi upturned, in female the 2nd joint long and reaching above vertex of head, the 3rd long; antennæ of male ciliated; tibiæ with tufts of spinous hair near base and extremity. Fore-



Macalla derogatella, ♂, ½ (from Moths Ind., vol. iv.).

wing with veins 4, 5 closely approximated for one-third length; 7, 8, 9 stalked; 10, 11 free. Hindwing with vein 3 from angle of cell; 4, 5 closely approximated for one-third length; 6, 7 from angle of cell or shortly stalked; 8 free.

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Sect. I. (*Lamida*). — Male with the 2nd joint of palpi short, the 3rd immensely dilated and curved over vertex of head with a hollow containing the maxillary palpi which are tufted with long hair; paired tufts of hair behind antennæ.

(1). MACALLA MONCUSALIS, Wlk., Cat., xvi., p. 252 . . . . . N.-E. India.
†*Allata penicillata*, Wlk., xxvii., 111.
†*Orthaga obscura*, Moore, Lep. Atk., 201.
(2). †MACALLA SYRICTHUSALIS, Wlk., xvi., 165 . . . . . N.-E. India, Borneo.
(3). †MACALLA NUBILALIS, Hmpsn., Ill. Het., ix., 157, pl. 172, fig. 9 . . . . . S. India, Ceylon.
(4). °MACALLA PHIDIASALIS, Wlk., xvi., 166 . Borneo.
(5). †MACALLA INIMICA, Butl., A. M. N. H. (5), iv., 448 . . . . . Japan.
(6). †MACALLA AMICA, Butl., A. M. N. H. (5), iv., 447 . . . . . Japan.
(7). †MACALLA NIGRESCENS, Warr., A. M. N. H. (6), vii., p. 428 (♀) . . . . Japan.
(8). †MACALLA ALBIFUSA, Hmpsn., Moths of India, vol. iv., p. 113 . . . . N.-E. India.

Sect. II. Palpi of male with the 2nd joint hollowed out to receive the brush-like maxillary palpi.

A. Antennæ of male with a short process from basal joint.

a. Forewing of male with a very large glandular swelling on costa beyond middle, the wing membrane and neuration much distorted.

(9). MACALLA SAGARISALIS, Wlk., xvi., 160 . Borneo.

b. Forewing of male with small glandular swelling on costa.

(10). †MACALLA RECURVALIS, Wlk., xxvii., 107 (♀). . . . . Australia.
†*Exacosmia rubiginosa*, Wlk., xxxii., 609.
†*Crambus melanospilellus*, Wlk., xxxv., 1759.
Balanotis crypsaula, Meyr., Trans. Ent. Soc., 1887, p. 191.
(11). †MACALLA MARMOREA, Warr., A. M. N. H. (6), vii., p. 432 . . . . . Tasmania.
(12). †MACALLA CHOLICA, Meyr., Trans. Ent. Soc., 1884, p. 66 (♀) . . . . Australia.

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B. (*Macalla*). Antennæ of male with a long process from basal joint extending to end of thorax; forewing with no costal swelling.

Type. (13). †MACALLA THYRSISALIS, Wlk., xvi., 156 . Honduras.
†*Aradrapha mixtalis*, Wlk., xxxiv., 1257.

(14). †MACALLA HYPOXANTHA, n. sp.

♂. Head and thorax black with a few ochreous scales; abdomen wholly black. Forewing fuscous, the areas below basal part of median nervures, at apex and outer angle tinged with rufous; an indistinct obliquely sinuous antemedial black line; large tufts of black scales in end of cell and on discocellulars; a minutely dentate black postmedial line, oblique and defined by grey from costa to vein 4 where it is strongly angled, angled inwards below vein 2. Hindwing ochreous suffused with fuscous especially on outer half; brownish ochreous below, the costa suffused with black.

Hab. Sikhim, 1800′ (Dudgeon). *Exp.* 26 mm.

Sect. II. (*Telephasa*).—Male with the maxillary palpi filiform; the 2nd joint of palpi short, the 3rd upturned straight, reaching far above vertex of head and thickly clothed in front with downwardly directed hair; antennæ fasciculate with a short process from basal joint.

(15). MACALLA DEROGATELLA, Wlk., xxvii., 30 N.-W. and E. Himalayas, Borneo.
†*Telephasa orbiculifera*, Moore, Lep. Atk., p. 201.
†*Telephasa nubilosa*, Moore, Lep. Atk., p. 201.

Sect. III. Palpi of male with a fringe of hair on 1st joint above so that the palpi are thrown forward; the 2nd joint long with fringe of downcurved hair longest towards extremity; 3rd joint minute and porrect; basal joint of antennæ long without process, the shaft set on at an angle.

(16). †MACALLA SCOPIRHYNCHA, Hmpsn., Moths Ind., iv., p. 114 . . . . . Sikhim.

Sect. IV. Male with the palpi similar to female.

A. (*Epipaschia*). Antennæ of male with a process from basal joint recurved over thorax and fringed with long hair and scales below.

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a. Male with the antennal process long.

(17).	MACALLA SUPERATALIS, Clem., Pr. Ac. N. S. Phil., 1860, p. 14	U. S. A.
	†*Pyralis costigeralis*, Wlk., xxxiv., 1226.	
	†*Pyralis costiferalis*, Wlk., xxxv., 1977.	
	†*Deuterolyta borealis*, Grote, Bull. Buff., i., p. 177.	
	Tetralopha olivalis, Hulst., Tr. Am. Ent. Soc., xiii., p. 160.	
(18).	†MACALLA ZELLERI, Grote, Can. Ent., viii., p. 157	U. S. A.
(19).	MACALLA VALIDALIS, Wlk., xxxiv., 1218 .	N.-E. India,
	†*Scopocera minor*, Moore, Lep. Atk., p. 203.	Borneo.
	Peucela fumosalis, Warr., A. M. N. H. (6), xvii., p. 461.	
(20).	†MACALLA PAPUENSIS, Warr., A. M. N. H. (6), vii., p. 431 (♀)	New Guinea.

b. The antennal process of male short.

(21).	†MACALLA FUNEREA, Wlk., xxvii., 31. .	Australia.
(22).	MACALLA PYRASTIS, Meyr., Trans. Ent. Soc., 1887, p. 190	Australia.

B. Antennæ of male with no process from basal joint.

a. (*Parasarama*). Forewing of male with no glandular swelling on costa, and tuft of scales in cell below.

a[1]. Hindwing of male not clothed with silky scales, and with no tuft of hair on inner area.

(23).	MACALLA DIMIDIALIS, Snell., Trans. Ent. Soc., 1890, p. 568	Sikhim.
(24).	*MACALLA PICTA, Warr., A. M. N. H. (6), xvi., p. 461	Queensland.
(25).	†MACALLA PARVULA, Hmpsn., Moths of India, vol. iv., p. 115	Bhúj, Cutch.
(26).	†MACALLA EXRUFESCENS, Hmpsn., Moths of India, vol. iv., p. 116.	Sikhim.
(27).	†MACALLA MARGARITA, Butl., Ill. Het., iii., p. 66, pl. 57, fig. 4	Japan, N.-E. India, Nilgiris,
	Locastra lativitta, Moore, Lep. Atk., p. 199, pl. 7, fig. 1	Borneo.

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Parasarama conjuncta, Warr., A. M. N. H. (6), xvii, p. 454
Parasarama rufilinctalis, Warr., A. M. N. H. (6), xvii., p. 455.

(28). MACALLA PHILIASALIS, Wlk., xxvii., 104. Borneo.

(29). †MACALLA CUPROVIRIDALIS, Moore, P. Z. S., 1867, p. 87 . . . . . Sikhim.

*b*¹. Hindwing of male clothed with thick silky scales on both upper and undersides except the costal area; a large tuft of hair contained in a fold on inner margin.

(30). MACALLA TEGULALIS, Wlk., xxvii., 105 . Borneo.

b. (*Mimaglossa*). Forewing of male with a glandular swelling at middle of costa.

*a*¹. Forewing of male with a tuft of scales in cell below.

(31). †MACALLA NAUPLIALIS, Wlk., xvii., 272 . Australia.
†*Pyralis porphyralis*, Wlk., xxxiv., 1243

(32). MACALLA HABITALIS, Guen., Delt. and Pyr., p. 125 (♀) . . . . . Tasmania.
Pyralis cerealis, Wlk., Trans. Ent. Soc. (3), i., p. 121.
†*Mimaglossa revulsa*, Warr., A. M. N. H. (6), vii., p. 428.

*b*¹. Forewing of male with no tuft of scales in cell below.

(33). *MACALLA MNESIBRYA, Meyr., Trans. Ent. Soc., 1884, p. 71 . . . . . Australia.

Auctorum.

Epipaschia interruptella, Rag., Bull. Soc. Ent. Fr. (6), viii., p. 150 . . . U.S.A.

Genus CŒNODOMUS.

Cœnodomus, Wlsm., Tr. Linn. Soc., 1889, p. 49.
Alippa, Aurivilius, Ent. Tids., 1894, p. 176.

Palpi upturned, thickly scaled and hardly reaching vertex of head, the 2nd joint in male hollowed out to receive the brush-like

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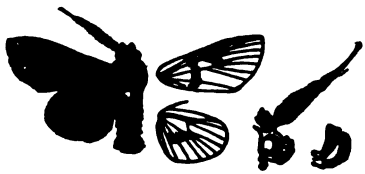
maxillary palpi; antennæ of male bipectinated to two-thirds length with long branches decreasing distally and with a process fringed with hair from basal joint; tibiæ and tarsal joints fringed with hair. Forewing with veins 3, 4, 5 from close to angle of cell;



Cœnodomus hockingii, ♂, ½ (from Moths Ind., vol. iv.).

6 from upper angle; 7, 8, 9 stalked; 10, 11 free; a large antemedial ridge of long hair from below the cell to inner margin, and a tuft at upper angle. Hindwing with veins 3, 4, 5 from close to angle of cell; 6, 7 from upper angle; 8 free; tufts of long hair near lower angle of cell.

Sect. I. Antennæ of male with the process from basal joint short.

Type (1). †Cœnodomus hockingii, Wlsm., Trans. Linn. Soc. Zool., v., 1889, p. 49, pl. 5 *Alippa anomala*, Aurivilius, Ent. Tids., 1894, p. 176. N.-W. and E. Himalayas, Bengal, Java.

(2). †Cœnodomus rotundinidus, Hmpsn., Ill. Het., viii., p. 127, pl. 154, fig. 16 . . Nilgiris.

Sect. II. Antennæ of male with the process from basal joint reaching to end of metathorax.

(3). †Cœnodomus dudgeoni, Hmpsn., Moths of India, vol. iv., p. 118 . . . . Bhután.

Genus Cecidipta.

Cecidipta, Berg., Stett. Ent. Zeit., xxxix., p. 230 (1878).

Palpi upturned and reaching vertex of head; maxillary palpi filiform; antennæ of male with short fasciculate branches, a tuft

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of hair on basal joint; tibiæ thickly fringed with hair. Forewing with veins 3, 4, 5 from angle of cell; 6 from upper angle; 7, 8, 9,

Cecidipta excæcariæ, ♂, $\frac{1}{1}$.

10 stalked; 11 free. Hindwing with vein 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle; 8 free.

Type. CECIDIPTA EXCÆCARIÆ, Berg., Stett. Ent. Zeit., xxxix., p. 230, fig. 2 . . . . Argentina.

Genus LOCASTRA.

Locastra, Wlk., xvi., 158 (1858).
Homura, Led., Wien Ent. Mon., 1863, p. 339.
Taurica, Wlk., xxxiv., 1268 (1865).

Palpi upturned and reaching vertex of head; maxillary palpi dilated with scales; antennæ of male minutely serrate and fasciculate; tibiæ fringed with long hair. Forewing with veins 3, 4, 5

Locastra crassipennis, ♂, $\frac{1}{1}$ (from Moths Ind., vol. iv.).

from angle of cell; 6 from below upper angle; 7, 8, 9 stalked. Hindwing with vein 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle, 7 often connected with 8 by a bar.

Sect. I. Forewing of male with a glandular swelling on costa at two-thirds from base; hind tarsi fringed with hair.

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A. (*Locastra*). Male with the process on basal joint of antennæ large; mid tibiæ extremely thickly clothed with rough curved scales to near extremity. Hindwing with the inner area clothed with long hair.

Type. (1). †LOCASTRA CRASSIPENNIS, Wlk., xi., 558 . Assam,
Locastra maimonalis, Wlk., xvi., 159. Borneo.

B. (*Taurica*). Male with the process on basal joint of antennæ smaller; mid tibiæ clothed with long hair but without thick curved scales.

(2). †LOCASTRA MUSCOSALIS, Wlk., xxxiv., 1269 China, N.-E.
†*Taurica sikhima*, Moore, Lep. Atk., p. 202. India, Ceylon, Burma.
†*Locastra cristalis*, Hmpsn., Ill. Het., ix., p. 157, pl. 172, fig. 3.

Sect. II. (*Homura*). — Forewing of male with no glandular swelling on costa; mid and hind tarsi not fringed with hair.

A. Antennæ of male with long process from basal joint; hind with the inner area slightly hairy.

(3). LOCASTRA NOCTURNALIS, Led., Wien Ent. Mon., 1863, p. 340, pl. 7, fig. 7 . . Brazil.
†*Homura trisulcata*, Warr., A. M. N. H. (6), vii., p. 434.

B. Antennæ of male with no process from basal joint; forewing with patch of thick brown scales below cell on underside. Hindwing broad with patch of brown scales above in cell; claspers very large with paired genital tufts.

(4). †LOCASTRA PACHYLEPIDALIS, Hmpsn., Moths of India, vol. iv., p. 119. . . . Bhután.

Genus STERICTA.

Stericta, Led., Wien Ent. Mon., vii., p. 340 (1863).
Glossina, Guen., Delt. and Pyr., p. 124 (1854) preocc.
Deuterolyta, Led., Wien Ent. Mon., vii., p. 338.
Pseudocera, Wlk., xxvii., 116 (1863).

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Canipsa, Wlk., xxxiv., 1217 (1865).
Matalia, Wlk., xxxv., 1727 (1866).
Phialia, Wlk., xxxv., 1736.
Cacozelia, Grote, Proc. Bost. Soc. N. H., xix., 264 (1877).
Craneophora, Christ., Bull. Mosc., 1881, lvi. (1), p. 1.
Leptosphetta, Butl., Trans. Ent. Soc., 1878, p. 67.
Pycnulia, Zell., Hor. Ent. Ross., xvi., p. 187 (1833).
Sarama, Moore, Lep. Atk., p. 203 (1888).
Winona, Hulst., Ent. Am., iv. 113 (1887).
Belenopholis, Butl., Ill. Het., vii., p. 89 (1890).
Rœselioides, Warr., A. M. N. H. (6), vii., p. 435.
Trichotophysa, Warr., A. M. N. H. (6), xvii., p. 457 (1896).

Palpi upturned and smoothly scaled, the 2nd joint reaching above vertex of head, the 3rd long; tibiæ slightly fringed with hair, hind tibiæ with a terminal tuft on outer side. Forewing

Stericta haraldusalis, ♂, ½ (from Moths Ind., vol. iv.).

with vein 3 from near angle of cell; 4, 5 from angle; 6 from or from above upper angle; 7, 8, 9 stalked; 10, 11 free. Hindwing with vein 3 from near angle of cell; 4, 5 from angle; 6, 7 on a short stalk; 8 free.

Sect. I. Antennæ of male with a process on basal joint recurved over thorax and fringed with long scales.

A. Palpi of male with the 2nd joint hollowed out to receive the brush-like maxillary palpi.

a. Forewing of male with no glandular swelling on costa, and tuft of scales in cell below.

a[1]. Antennæ of male ciliated.

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a^2. (*Stericta*). Forewing with slight tufts of scales below and beyond cell.

Type. (1). STERICTA DIVITALIS, Guen., Delt. and Pyr., p. 124, pl. 7, fig. 4 . . . . . N.-E. India, Ceylon, Borneo.
†*Locastria phereciusalis*, Wlk., xvi., 159.

(2). †STERICTA EVANESCENS, Butl., A. M. N. H. (5), xx., p. 115 (♀) . . . . . Solomon Isls.

(3). †STERICTA RUFESCENS, Hmpsn., Moths of India, vol. iv., p. 120 . . . . . Bhután.

(4). STERICTA ASOPIALIS, Snell., Trans. Ent. Soc., 1890, p. 568 . . . . . E. Himalayas.

(5). STERICTA COSPICUALIS, Led., Wien Ent. Mon., 1863, p. 359, pl. 7, figs. 16, 17 . Amazons.
Deuterolyta cristalis, Feld., Reis. Nov., pl. 136, fig. 17.

(6). †STERICTA EXTENSA, Wlk., xxvii., 61 . . Guiana, Brazil
Homura granitalis, Feld., Reis. Nov., pl. 136, fig. 15.
Hemimatia cacalis, Feld., Reis. Nov., pl. 136, fig. 16.
†*Deuterolyta variegata*, Warr., A. M. N. H. (6), vii., p. 433.

b^2. (*Craneophora*). Forewing with ridge of long hair beyond the cell and another below it. Hindwing with ridges beyond cell and on inner area.

(7). STERICTA HARALDUSALIS, Wlk., xvi., 160 Siberia,
Craneophora ficki, Christ., Bull. Mosc., 1881, lvi. (1), p. 2. Japan, Himalayas, Burma,
Scopocera variegata, Moore, Lep. Atk., p. 203, pl. 7, fig. 4. Borneo.
†*Belenopholis striata*., Butl., Ill. Het., vii., p. 90, pl. 134, fig. 3.

b^1. Antennæ of male minutely serrate and fasciculate; palpi with slight tuft of hair at extremity of 2nd joint.

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a^2. (*Sarama*). Forewing with two large tufts of scales below the cell, large tufts in and beyond the end, a ridge below vein 2, and small tufts in the interspaces between veins 2 and 5.

(8). †STERICTA ATKINSONI, Moore, Lep. Atk., p. 204 . . . . . Sikhim.

b^2. Forewing with slight tufts of scales below the cell.

(9). †STERICTA BASIOCHRIALIS, Grote, Proc. Bost. Soc. N. H., xix., 264 . . . . . U. S. A.

(10). †STERICTA DISSIMILIS, Warr., A. M. N. H. (6), vii., p. 435 (♀) . . . . . Brazil.

c^1. (*Canipsa*). Antennæ of male thickened and flattened; forewing with ridges of long hair beyond the cell below veins 2 and 6, and a shorter ridge above vein 6. Hindwing with ridges below vein 6 and between lower angle of cell and anal angle.

(11). †STERICTA PYRALIATA, Moore, Lep. Atk., p. 202 . . . . . Sikhim.

(12). STERICTA SINUOSA, Moore, Lep. Atk., p. 203, pl. 7, fig. 3 . . . . . E. Himalayas.

(13). STERICTA SUSPENSALIS, Wlk., xxxiv., 1217 Borneo.

(14). STERICTA AGLOSSALIS, Warr., A. M. N. H. (6), xvii., p. 456 . . . . . N.-W. Himalayas, Assam.

b. (*Phialia*). Forewing of male with a glandular swelling at middle of costa and a ridge of large scales in cell below.

(15). †STERICTA COSTIGERALIS, Wlk., Tr. Ent. Soc. (3), i., p. 121 . . . . . Australia, Tasmania.
Phialia gelechiella, Wlk., xxxv., 1736.

(16). °STERICTA DEMOTIS, Meyr., Trans. Ent. Soc., 1887, p. 187 (♀) . . . . . Australia.

(17). †STERICTA CONCISELLA, Wlk., xxxv., 1728. Queensland, W. Australia.
Stericta rubroviridis, Warr., A. M. N. H. (6), xvi., p. 463.

(18). STERICTA PRASINA, Warr., A. M. N. H. (6), xvi., p. 462 (♀) . . . . . Queensland.

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B. (*Pseudocera*). Maxillary palpi of male filiform.

(19). †STERICTA INCONCISA, Wlk., xxvii., 116 . Borneo.
(20). °STERICTA DAPHA, Druce, Biol. Centr. Am. Het., ii, p. 198, pl. 60, fig. 3 . . Centr. Am.

Sect. II. Antennæ of male with no process from basal joint.

A. (*Leptosphetta*). Palpi of male hollowed out to receive the brush-like maxillary palpi.

a. Hind legs of male not tufted.

(21). °STERICTA MIANALIS, Feld., Reis. Nov., pl. 136, fig. 18 . . . . . Brazil.

b. Hind tibiæ and 1st tarsal joints of male with large tufts of scales and hair; large patches of androconia near lower angle of cell of both wings below.

(22). STERICTA SCOPIPES, Feld., Reis. Nov., pl. 136, fig. 39 . . . . . Brazil.
†*Leptosphetta rabdina*. Butl., Trans. Ent. Soc., 1878, p. 67.
†*Pycnulia ministra*, Zell., Hor. Ent. Ross., xvi., p. 187, pl. 11, fig. 15.
(23). †STERICTA ABRUPTA, Zell., Hor. Ent. Ross., xvi., p. 189, pl. 11, fig. 16 . . . Colombia, Brazil.

B. Maxillary palpi filiform.

a. Forewing of male with no fovea beyond cell.

(24). †STERICTA CARNEOTINCTA, Hmpsn., Moths of India, vol. iv., p. 123 . . . . Sikhim, Pulo Laut.
(25). †STERICTA MIXTALIS, Wlk., xxvii., 104 (♀) Borneo.
(26). °STERICTA PLUMBEFLOCCALIS, Hmpsn., Moths of India, vol. iv., p. 123 . . Burma.

b. (*Trichotophysa*). Forewing of male with a large fovea on underside below the discocellulars covered with hair, and with vein 6 bent round it.

(27). †STERICTA JUCUNDALIS, Wlk., xxxiv., 1164; Hmpsn., Ill. Het. ix., p. 172, fig. 7 . . N.-E. India, Ceylon.
Trichotophysa olivalis, Warr., A. M. N. H. (6), xvii, p. 457.

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Auctorum.

Stericta æruginosa, Lucas, P. Linn. Soc. N. S. W., viii., p. 155 . . . . . Queensland.

Genus Orthaga.

Orthaga, Wlk., xvi., 191 (1858).
Edeta, Wlk., xvi., 198.
Catamola, Meyr., Trans. Ent. Soc., 1884, p. 63.
Balanotis, Meyr., Trans. Ent. Soc., 1884, p. 69.
Pannucha, Moore, Lep. Atk., p. 199 (1887).
Proboscidophora, Warr., A. M. N. H. (6), vii., p. 429 (1891).
Hyperbalanotis, Warr., A. M. N. H. (6), vii., 433.

Palpi upturned, reaching vertex of head and roughly scaled; antennæ of male minutely serrate and fasciculate; tibiæ nearly smoothly scaled. Forewing with vein 3 from near angle of cell;

Orthaga basalis, ♂, ½ (from Moths Ind., vol. iv.).

4, 5 from angle; 7, 8, 9 stalked. Hindwing with vein 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle or shortly stalked.

Sect. I. Antennæ of male with a thickly scaled process from basal joint, reaching to collar.

A. (*Catamola*). Male with the 2nd joint of palpi hollowed out to receive the brush-like maxillary palpi; a furrow on underside beyond upper angle of cell above vein 6.

(1). †Orthaga thyrisalis, Wlk., xvi., 167 . Australia.
Pyralis nigricalis, Wlk., Trans. Ent. Soc. (3), i., p. 120.

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(2). °ORTHAGA ATRIBASALIS, Warr., A. M. N. H. (6), xvi., p. 461 (♀) . . . . . Queensland.

(3). †ORTHAGA XANTHOMELALIS, Wlk., xxvii., 31 (♀) . . . . . Australia.

B. (*Pannucha*). Male with the maxillary palpi filiform.

a. Male with a glandular swelling on costa at two-thirds from base, veins 10 and 11 bent round it, and vein 6 bent down to near 5.

(4). †ORTHAGA ÆNESCENS, Moore, Lep. Atk., p. 200 . . . . . N.-E. India.
Pannucha vicinalis, Snell, Trans. Ent. Soc., 1890, p. 567, pl. 20, figs. 2, 2A.

(5). ORTHAGA BASALIS, Moore, Lep. Atk., p. 200, pl. 7, fig. 2 . . . . . N.-E. India.

(6). †ORTHAGA OLIVACEA, Warr., A. M. N. H. (6), v.i, p. 433 . . . . . Japan.

(7). †ORTHAGA ACHATINA, Butl., Ill. Het., ii., p. 56, pl. 38, fig. 10 . . . . . Japan.

(8). †ORTHAGA VITIALIS, Wlk., xix., 897 . . Ceylon, Australia.
†*Pyralis helvialis*, Wlk., xix., 915.
†*Pyralis altusalis*, Wlk., xix., 1022.

b. Male with no glandular swelling on costa of forewing; vein 6 straight.

(9). °ORTHAGA EURYZONA, Hmpsn., Moths of India, vol. iv., p. 128 . . . . Burma.

(10). ORTHAGA SEMINIVEA, Warr., A. M. N. H. (6), xvi., p. 463 (♀) . . . . Queensland.

Sect. II. Antennæ of male with no process from basal joint.

A. (*Orthaga*). Palpi of male with the 3rd joint short; forewing with a glandular swelling on costa at two-thirds from base; vein 6 bent down to near 5.

a. Maxillary palpi filiform.

Type. (11). †ORTHAGA EUADRUSALIS, Wlk., xvi., 191, Moore, Lep. Ceyl., iii., pl. 178, fig. 2 . India, Ceylon, Borneo.
Orthaga acontialis, Wlk., xxvii., 103.

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(12). †ORTHAGA MOLLERI, Hmpsn., Moths of India., vol. iv., p. 126 . . . . Sikhim.

(13). ORTHAGA RUDIS, Wlk., Trans. Ent. Soc. (3), i., p. 115 (♀) . . . . . Nilgiris.

(14). †ORTHAGA EXVINACEA, Hmpsn., Ill. Het., viii., p. 127, pl. 154, fig. 9 (♀) . . Nilgiris.

(15). †ORTHAGA ROSEIPLAGA, Hmpsn., Moths of India, vol. iv., p. 124 . . . . Bombay.

(16). †ORTHAGA AUROVIRIDALIS, Hmpsn., Moths of India, vol. iv., p. 126 . . . . N.-E. and S. India.

(17). †ORTHAGA IRRORATA, Hmpsn., Ill. Het., ix., p. 156, pl. 172, fig. 1 (♀) . . . Ceylon.

(18). ORTHAGA HERCOPHORA, Meyr., Trans. Ent. Soc., 1884, p. 281 (♀) . . . . Australia.

(19). †ORTHAGA DIDYMALIS, Wlk., xvii., 283 . Australia.
Balanotis arctandalis, Lucas, P. L. Soc. N. S. W. (2), iv., p. 1098.

b. Maxillary palpi triangularly scaled against the frons; forewing with the glandular swelling very large; an elongate fovea in cell containing a series of verticle laminate plates.

(20). ORTHAGA ICARUSALIS, Wlk., xvi., 199 . Borneo.

c. Palpi of male hollowed out to receive the brush-like maxillary palpi.

(21). †ORTHAGA ONERATA, Butl., A. M. N. H. (5), iv., p. 447 . . . . . Japan, N.-E. India, Borneo.

B. (*Proboscidophora*). Palpi of male with the 3rd joint extremely long and porrect; forewing with a fan of large scales in cell below.

(22). †ORTHAGA TRITONALIS, Wlk., xix., 906 . Borneo.
†*Orthaga rotundalis*, Wlk., xxvii., 106.

Auctorum.

Balanotis hercophora, Meyr., Tr. Ent. Soc., 1884, p. 281 . . . . . Australia.

Balanotis ferruginea, Lucas, P. Linn. Soc. N. S. W., viii., p. 156 . . . . Queensland.

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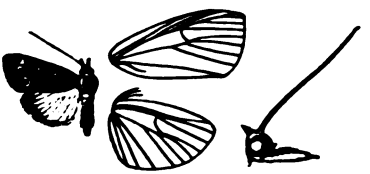
Genus Isolopha.

Isolopha. Hmpsn., A. M. N. H. (6), xvi., p. 346 (1895).

Palpi porrect, extending about twice the length of head, the 2nd joint fringed with hair above, the 3rd well developed; maxillary palpi filiform; antennæ of female almost single; tibiæ nearly



Isolopha lactealis, ♀, ½.

smooth. Forewing with vein 3 from near angle of cell; 4, 5 from angle; 6 from upper angle; 7, 8, 9 stalked; 10, 11 free. Hindwing with vein 3 from near angle of cell; 4, 5 approximated for a short distance; 6, 7 from upper angle; 8 free.

Type. †Isolopha lactealis, Hmpsn., A. M. N. H. (6), xvi., p. 347 (♀) . . . . W. Indies.

Genera *Auctorum*.

Yuma adulatalis, Hulst., Ent. Am., iii., p. 129; and v., p. 65 . . . . U. S. A.

Subfamily Endotrichinæ.

Proboscis well developed; maxillary palpi present; build slender. Forewing with vein 7 stalked with 8, 9 (7 absent in *Hendecasis*). Hindwing with the median nervure non-pectinate; vein 7 anastomosing with 8.

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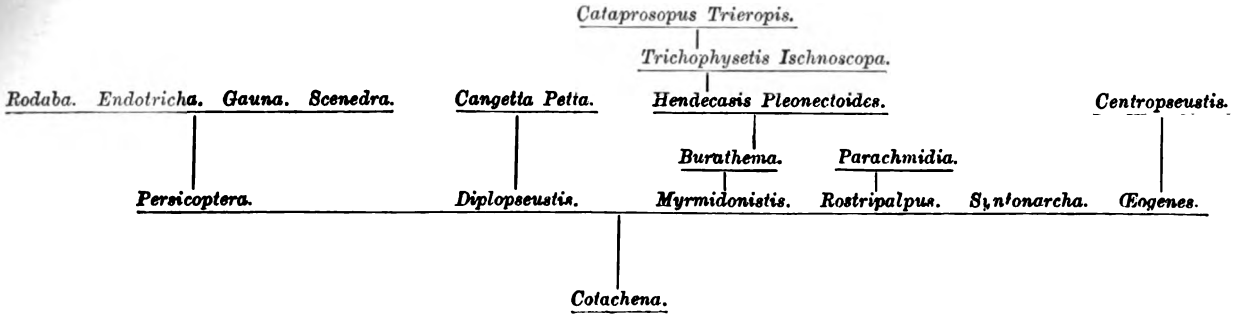
Phylogeny of the Endotrichinæ.



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Key to the Genera.

A. Palpi upturned.
- *a* Forewing with veins 3, 4, 5 stalked.
  - a^1 Forewing with vein 2 absent . . . . 7. *Petta.*
  - b^1 Forewing with vein 2 present . . . . 6. *Cangetta.*
- *b* Forewing with vein 3 from cell.
  - a^1 Palpi reaching well above vertex of head.
    - a^2 Forewing with the outer margin angled at vein 4, 10 stalked with 7, 8, 9 . . 1. *Rodaba.*
    - b^2 Forewing with the outer margin evenly curved, 10 free . . . . . 3. *Gauna.*
  - b^1 Palpi not reaching vertex of head.
    - a^2 Both wings with veins 4, 5 stalked or closely approximated for some distance 2. *Endotricha.*
    - b^2 Forewing with veins 4, 5 stalked, hindwings with 4, 5 radiating from angle; the costa of forewing excised at middle 4. *Scenedra.*
    - c^2 Both wings with veins 4, 5 well separated towards origin . . . . . 5. *Persicoptera.*

B. Palpi porrect.
- *a* Palpi straight.
  - a^1 Palpi extending about the length of head.
    - a^2 Palpi fringed with long hair below . . 21. *Œnogenes.*
    - b^2 Palpi triangularly scaled . . . . 22. *Cotachena.*
  - b^1 Palpi extending twice to three times length of head.
    - a^2 Maxillary palpi triangularly scaled.
      - a^3 Forewing with vein 7 absent.
        - a^4 Hindwing with vein 5 present; forewing with 8, 9, 10 stalked . . . 13. *Hendecasis.*
        - b^4 Hindwing with vein 5 absent; forewing with 10 from cell . . . 12. *Ischnoscopa.*
      - b^3 Forewing with vein 7 stalked with 8 9,10 15. *Burathema.*
      - c^3 Forewing with veins 7, 8, 9 stalked, 10 from cell 16. *Myrmidonistis.*
    - b^2 Maxillary palpi with a pointed tuft nearly as long as the labial palpi . . . 11. *Trichophysetis.*
- *b* Palpi rostriform and downcurved.
  - a^1 Palpi extending about the length of head; veins 4, 5 of both wings stalked . . 18. *Rostripalpus.*
  - b^1 Palpi extending about twice the length of head.
    - a^2 Both wings with veins 4, 5 from cell.
      - a^3 Maxillary palpi triangularly scaled; forewing with the subcostal and median nervures approximated . . . . 19. *Syntonarcha.*
      - b^3 Maxillary palpi filiform; forewing with the subcostal and median nervures not approximated . . . . . 20. *Centropseustis.*
    - b^2 Forewing with veins 4, 5 from cell; hindwings with veins 4, 5 stalked . . 9. *Cataprosopus.*
    - c^2 Both wings with veins 4, 5 stalked.
      - a^3 Forewing with vein 7 present; maxillary palpi dilated with scales . . . 14. *Pleonectoides.*
      - b^3 Forewing with vein 7 absent; maxillary palpi filiform . . . . . 17. *Parachmidia.*
    - c^1 Palpi extending about four times length of head and hollowed out to receive the brush-like maxillary palpi . . . 10. *Trieropis.*

C. Palpi with the 2nd joint porrect and thickly scaled, the 3rd obliquely upturned, naked and set on before the apex of 2nd . . 8. *Diplopseustis.*

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Genus Rodaba.

Rodaba, Moore, Lep. Atk., p. 205 (1888).

Palpi obliquely upturned, the 2nd joint reaching far above vertex of head and fringed with hair on both sides, the 3rd acute; maxillary palpi minute and filiform; antennæ nearly simple; tibiæ with the spurs long. Forewing with the costa nearly straight;

Rodaba angulipennis, ♂, ½ (from Moths Ind., vol. iv.).

the apex falcate; the outer margin excised from apex to vein 4 where it is angled, then excised to outer angle; vein 3 from close to angle of cell; 4, 5 from angle; 7, 8, 9, 10 stalked. Hindwing with the apex somewhat produced; vein 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Type. †Rodaba angulipennis, Moore, Lep. Atk., p. 205 . Sikhim.

Genus Endotricha.

Endotricha, Zell., Iris., 1847, p. 593.
Doththa, Wlk., xvii., 285 (1859).
Messatis, Wlk., xix., 918 (1859).
Pacoria, Wlk., xxxiv., 1255 (1865).
Zania, Wlk., xxxiv., 1256.
Tricomia, Wlk., xxxiv., 1259.
Rhisina, Wlk., xxxiv., 1324.
Endotrichodes, Rag., Ann. Soc. Ent. Fr., 1890, p. 521.
Endotrichopsis, Warr., A. M. N. H. (6), xvi., p. 467 (1895).
Perisseretma, Warr., A. M. N. H. (6), xvi., p. 468.

Palpi upturned, the 2nd joint hardly reaching vertex of head and thickly scaled; maxillary palpi minute and filiform; antennæ of male ciliated, the basal joint somewhat dilated; patagia of male with long tufts of hair extending far beyond metathorax; abdomen with thick lateral anal tufts; legs long, slender and smoothly

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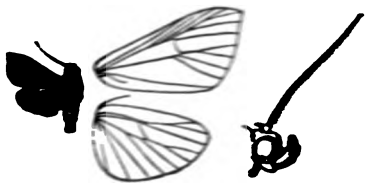
scaled. Forewing usually long and narrow; the costa arched towards apex, which is acute: vein 3 from before angle of cell;



Endotricha mesenterialis. ♂, ½ (from Moths Ind., vol. iv.).

4, 5 approximated towards origin or stalked; 10, 11 free. Hindwing with vein 3 from before angle of cell; 4, 5 approximated towards origin or stalked; 6, 7 shortly stalked.

Sect. I. (*Zania*).—Male with the forewing very broad, the inner margin expanded and lobed, the outer margin erect. Hindwing very broad with a fold running from the base through the cell to outer margin, the inner area expanded and lobed.

A. Forewing of male with large tuft of long hair from base of inner margin, the lobe greatly developed and roughly scaled, the costa arched upwards towards apex.

(1). *ENDOTRICHA DISPERGENS, Lucas, P. L. Soc. N. S. W. (2), vi., p. 306 . . . . Queensland.

B. Forewing of male with no tuft of hair; the lobe rounded and smoothly scaled; the costa evenly arched.

(2). †ENDOTRICHA THEONALIS, Wlk., xix., 900 . China.
†*Pyralis thermusalis*, Wlk., xix., 912.
†*Zania unicalis*, Wlk., xxxiv., 1257.

(3). †ENDOTRICHA DECESSALIS, Wlk., xvii., 390; and xxxiv., p. 1234. Hmpsn., Ill. Het., ix., pl. 172, fig. 11 . . . . . Ceylon, Burma, Sambawa.

Sect. II. Male with the wings normal.

A. (*Perisseretma*). Maxillary palpi of male porrect, twice as long as the labial, curved and meeting at apex; fringed with long scales on inner side towards extremity.

(4). *ENDOTRICHA ENDOTRICHALIS, Wrr., A. M. N. H. (6), xvi., p. 468 . . . . N.-W. Himalayas.

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B. Maxillary palpi normal.

a. (*Endotrichopsis*). Palpi of male with the 3rd joint long, recurved over head and with tuft of scales at end of 2nd joint; antennæ of male with scale tooth on basal joint.

(5). †ENDOTRICHA PORTIALIS, Wlk., xvii., 391 . Japan, Borneo, Java.
Doththa cæcusalis, Wlk., xix., 921.
Endotricha acrobasalis, Snell., Tijd. v. Ent., xxxvi, p. 155, pl. x., fig. 1.
Endotrichopsis rhodopteralis, Warr., A. M. N. H. (6), xvi., p. 467.

b. (*Endotricha*). Palpi of male normal.

*a*¹. Antennæ of male with tooth on basal joint.

(6). †ENDOTRICHA MESENTERIALIS, Wlk., xvii., 285; and xix., p. 920. Moore, Lep. Ceyl., iii., pl. 178, fig. 8. Formosa, India, Ceylon, Burma, Java.
†*Endotricha suffusalis*, Wlk., xvii., 390 .
† „ *flavifimbrialis*, Warr., A. M. N. H. (6), viii., p. 69.
†*Endotricha eoidalis*, Snell., Tijd. v. Ent., xxxviii., p. 10, pl. v., figs. 2 and 3.

*b*¹. Antennæ of male normal.

(7). ENDOTRICHA FLAMMEALIS, Schiff. . Europe.
(8). ENDOTRICHA PYROSALIS, Guen., Delt. and Pyr., p. 219 . . . . . Australia.
Endotricha ignealis, Guen., Delt. and Pyr., p. 220.
†*Messatis sabirusalis*, Wlk., xix., 918.
†*Paconia albifimbrialis*, Wlk., xxxiv., 1255.
†*Tricomia auroralis*, Wlk., xxxiv., 1259.
†*Rhodaria robina*, Butl., A. M. N. H. (5), x., p. 26.
(9). †ENDOTRICHA ALBICILIA, Hmpsn., Ill. Het., viii., p. 130, pl. 154, fig. 22 . . . Sikhim, S. India, Ceylon.
(10). †ENDOTRICHA DOCILISALIS, Wlk., xix., 913 Australia.
Endotricha æthopa, Meyr., Trans. Ent. Soc., 1884, p. 79.
(11). †ENDOTRICHA STILBEALIS, Wlk., xix., 913 Australia.
Endotricha heliopa, Meyr., Trans. Ent. Soc., 1884, p. 78.

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(12).	†ENDOTRICHA OBSCURA, Butl., Trans. Ent. Soc., 1886, p. 427	Australia.
(13).	ENDOTRICHA SONDAICALIS, Snell., Tijd. v. Ent., xxiii., p. 200; and xxvi., pl. 6, fig. 6	N.-W. Himalayas, Sikhim, Celebes.
	†*Doththa similata*, Moore, Lep. Atk., p. 206.	
(14).	ENDOTRICHA COSTÆMACULALIS, Christ., Bull. Mosc., 1881, i., p. 4 . . .	Siberia, Japan, Himalayas.
	Endotricha fuscobasalis, Rag., Ann. Soc. Fr., 1890, p. 526.	
(15).	†ENDOTRICHA FUSCIFUSALIS, Hmpsn., Moths of India, vol. iv., p. 134 . . .	N.-W. Himalayas.
(16).	°ENDOTRICHA SERRATILIS, Snell., Trans. Ent. Soc., 1890, p. 570	Sikhim.
(17).	†ENDOTRICHA RUMINALIS, Wlk., xvii., 387	N.-E. India, Ceylon, Burma.
	Pyralis ibycusalis, Wlk., xix., 899 .	
	†*Endotricha symphonialis*, Hmpsn., Ill. Het., ix., p. 161, pl. 171, fig. 17.	
(18).	†ENDOTRICHA LORICATA, Moore, Lep. Atk., p. 206	Bengal, Ceylon.
	†*Pyralis ustalis*, Hmpsn., Ill. Het., ix., p. 159, pl. 172, fig. 26.	
(19).	†ENDOTRICHA ARDENTALIS, Hmpsn., Moths of India, vol. iv., p. 135 . . .	Bhután.
(20).	†ENDOTRICHA CONSOCIA, Butl., A. M. N. H., 1879, ii., p. 452	Japan.
(21).	†ENDOTRICHA ICELUSALIS, Wlk., xix., 900.	Japan, China.
	Rhodaria flavofascialis, Brem., Lep. E. Sib., p. 65, pl. 6, fig. 1.	
	†*Pyralis rosealis*, Wlk., xxxiv., 1236.	
(22).	†ENDOTRICHA FLAVIFUSALIS, Warr., A. M. N. H. (6), viii., p. 70	Borneo.
	ENDOTRICHA PERSICOPA, Meyr., Trans. Ent. Soc., 1889, p. 506	Borneo, New Guinea.
(23).	†ENDOTRICHA RUFOFIMBRIALIS, Warr., A. M. N. H. (6), viii., p. 69 . . .	Bhután, Borneo.
(24).	†ENDOTRICHA LUTEOGRISALIS, Hmpsn., Moths of India, vol. iv., p. 136 . .	Bhután.
(25).	†ENDOTRICHA PLINTHOPA, Meyr., Trans. Ent. Soc., 1886, p. 214	Samoa.
(26).	°ENDOTRICHA COMPSOPA, Meyr., Trans. Ent. Soc., 1887, p. 195	Australia.

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(27). †ENDOTRICHA DUPLICILINEA, Hmpsn., Ill. Het., ix., p. 159, pl. 171, fig. 21 . . Ceylon.

(28). †ENDOTRICHA ORTHOTIS, Meyr., Trans. Ent. Soc., 1894, p. 476 . . . . . Sambawa.

(29). †ENDOTRICHA PUNCTICOSTALIS, Wlk., xxxiv., 1324 . . . . . Australia.
Endotricha ustalis, Snell., Tijd. v. Ent., xxiii., p. 201; and 1883, pl. 6, fig. 7.

(30). †ENDOTRICHA LISTERI, Butl., P. Z. S., 1888, p. 546 . . . . . Christmas Is.

(31). *ENDOTRICHA RUFOTERMINALIS, Christ., Bull. Mosc., lvi., p. 34 . . . . Amur, Assam.
Cangetta venustalis, Warr., A. M. N. H. (6), xvii, p. 464.

(32). ENDOTRICHA PYGMÆALIS, Warr., A. M. N. H. (6), xvii., p. 204 . . . . Assam.

(33). *ENDOTRICHA DRANCESALIS, Wlk., xix., 961 Borneo.

Auctorum.

Endotricha consobrinalis, Zell., Lep. Caffr., p. 24 . . . . . S. Africa.
Endotricha coreacelis, Pagenst., J. B. Nass. Ver., xxxvii., p. 266 . . . . . Amboina.
Endotricha aglaopa, Meyr., Trans. Ent. Soc., 1887, p. 196 . . . . . Australia.
Endotricha wamneralis, Pag., J. B. Nass. Ver., xxxix., p. 168 . . . . . Avri.
Endotricha vinolentalis, Rag., Ann. Ent. Soc. Fr., 1891, p. 525 . . . . . W. Africa.
Endotricha ragonoti, Christ., Deutsche Ent. Zeit. Lep., vi., p. 96 . . . . . C. Asia.
Endotricha rogenhöferi, Rebel, Ann. Hofm. Wien, vii., p. 249, pl. xvii., fig. 1 . . . Canaries.
Endotricha crobulus, Lucas, P. L. Soc. N S.W. (2), vi., p. 305 . . . . . Queensland.
Endotricha suavalis, Snell., Tijd. v. Ent., xxxviii., p. 113 . . . . . Java.
Endotricha approximalis, Snell., Tijd. v. Ent., xxxviii., p. 115 . . . . . Java.

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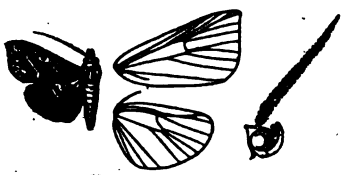
Genus Gauna.

Gauna, Wlk., xxxiv., 1252 (1865).
Œdematophaga, Meyr., Trans. Ent. Soc., 1884, p. 73.

Palpi upturned, reaching above vertex of head, the 2nd joint tufted with hair on inner side at extremity, the 3rd short; maxillary palpi short and filiform; frons with a tuft of hair; antennæ of male fasciculate; tibiæ moderately scaled. Forewing with the



Gauna ægusalis, ♂, ½.

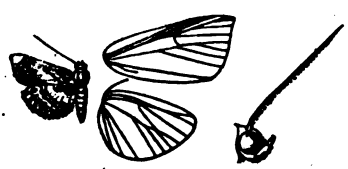
costa arched towards apex; vein 3 from near angle of cell; 4, 5 approximated for a short distance; 6 from upper angle; 7, 8, 9 stalked; 10, 11 free. Hindwing with veins 3, 4, 5 well separated at origin; 6, 7 from upper angle.

Type. †Gauna ægusalis, Wlk., xix., 912 . . . Australia.
†*Gauna subferralis*, Wlk., xxxiv., 1213.

Genus Scenedra.

Scenedra, Meyr., Trans. Ent. Soc., 1884, p. 75.

Palpi upturned, hardly reaching vertex of head and thickly scaled; maxillary palpi minute and thickly scaled; frons rounded;



Scenedra decoratalis, ♂, ½.

antennæ of male fasciculate; patagia of male reaching just beyond metathorax; tibiæ moderately scaled. Forewing with the costa excised at middle; vein 3 from before angle of cell; 4, 5 stalked;

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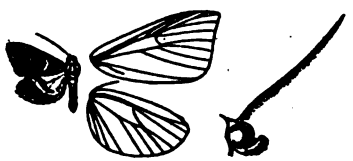
6 from upper angle ; 7, 8, 9 stalked ; 10, 11 free. Hindwing with vein 3 from before angle of cell ; 4, 5 from angle ; 6, 7 from upper angle.

Type. †SCENEDRA DECORATALIS, Wlk., xxxiv., 1242 . Australia.
†*Pyralis contentalis*, Wlk., xxxiv., p. 1247.

Genus PERSICOPTERA.

Persicoptera, Meyr., Trans. Ent. Soc., 1884, p. 283.

Palpi upturned and reaching halfway to vertex of head, the 2nd joint fringed with long scales in front, the 3rd short ; maxillary palpi minute and filiform ; frons rounded : antennæ of male fasciculate ; tibiæ smoothly scaled. Forewing with vein 3 from



Persicoptera pulchrinalis, ♂, ½.

before angle of cell ; 4, 5 from angle ; 6 from upper angle ; 7, 8, 9 stalked ; 10 free ; 11 anastomosing with 12. Hindwing with vein 3 from before angle of cell ; 4, 5 from angle ; 6, 7 from upper angle.

Type. PERSICOPTERA PULCHRINALIS, Guen., Delt. and Pyr., p. 220, pl. iii., fig. 2 . . . . . Australia, Tasmania.
†*Scopula gavisalis*, Wlk., xxxiv., 1475.

Genus CANGETTA.

Cangetta, Moore, Lep. Ceyl., iii., p. 314 (1886).

Palpi upturned and hardly reaching vertex of head, the 2nd joint fringed with hair below, the 3rd conically scaled ; maxillary palpi as long as the labial, and dilated with scales at extremity ; frons flat and oblique ; antennæ annulated with rings at the joints ; legs long and slender ; tibiæ somewhat hairy. Forewing

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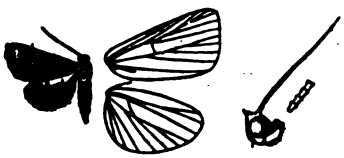
somewhat narrow; the cell short; veins 3, 4, 5 stalked; 6 from well below upper angle; 7, 8, 9, 10 stalked. Hindwing with the



Cangetta rectilinea, ♂, ⅔ (from Moths Ind., vol. iv.).

cell very short; vein 3 from angle; 4, 5 on a long stalk; 6, 7 from upper angle, 7 anastomosing strongly with 8.

Type. (1). †CANGETTA RECTILINEA, Moore, Lep. Ceyl., iii., p. 314, pl. 182, fig. 3. . . . Ceylon.
†*Paraponyx griseolalis*, Hmpsn., Ill. Het., ix., p. 176, pl. 174, fig. 12.

(2). CANGETTA ALBOCARNEA, Warr., A. M. N. H. (6), xvii., p. 149 . . . . . Assam, Ceylon, Pulo Laut.

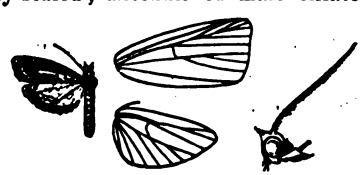
Auctorum.

Paraponyx hartoghialis, Snell., Tijd. v. Ent., (2), vii., p. 97, pl. 7, figs. 14, 15 . . . Guinea.

Genus PETTA.

Petta, Warr., A. M. N. H. (6), xvi., p. 469 (1895).

Palpi obliquely upturned, the 2nd joint fringed with very long hair below, the 3rd long, naked and acute; maxillary palpi long and triangularly scaled; antennæ of male ciliated; tibiæ nearly



Petta costistrigalis, ♂, ¾ (from Moths Ind., vol. iv.).

smooth, the spurs long. Forewing with the outer margin excised below apex; vein 2 absent; 3, 4, 5 stalked; 6 from upper angle; 7, 8, 9, 10, 11 stalked. Hindwing with vein 3 from angle of cell, or stalked with 4, 5; 6, 7 from upper angle.

Sect. I. Hindwing with vein 3 from cell.

TTA COSTISTRIGALIS, Hmpsn., Moths of ndia, vol. iv., p. 138 . . . . . Ceylon.

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Sect. II. Hindwing with vein 3 stalked with 4, 5.

Type. (2). PETRA ALTERNATA, Warr., A. M. N. H. (6), xvi., p. 469 . . . . . Assam, Borneo, Sambawa.

Genus DIPLOPSEUSTIS.

Diplopseustis, Meyr., Trans. Ent. Soc., 1884, p. 284.

Palpi porrect, the 2nd joint extending about twice the length of head and thickly scaled, the 3rd obliquely upturned and set on before the apex of 2nd joint; maxillary palpi large and triangularly scaled; frons oblique; antennæ of male somewhat thickened and flattened; tibiæ with the outer spurs about half the length of

Diplopseustis minima, ♂, ½.

inner. Forewing with the apex somewhat acute; the outer margin excised below the apex; vein 3 from close to angle of cell; 4, 5 stalked; 6 from upper angle; 7, 8, 9 stalked; 10, 11 free. Hindwing with the outer margin excised below apex; vein 3 from angle of cell; 4, 5 stalked; 6, 7 from upper angle.

Type. DIPLOPSEUSTIS PERIERESALIS, Wlk., xix., 958 . Formosa, Assam, Australia, N. Zealand, Fiji.
†*Cymoriza minima*, Butl., P. Z. S., 1880, p. 684
Diplopseustis constellata, Warr., A. M. N. H (6), xvii., p. 464.
Diplopseustis pallidalis, Warr., A. M. N. H. (6), xvii., p. 465.
Sufctula nana, Warr., A. M. N. H. (6), xviii., p. 225.

Auctorum.

Diplopseustis prophetica, Meyr., Trans. Ent. Soc., 1887, p. 198 . . . . . Australia.

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Genus Cataprosopus.

Cataprosopus, Butl., Trans. Ent. Soc., 1881, p. 589.

Prosboscis minute; palpi porrect, downcurved, extending about twice the length of head and fringed with hair on both sides; maxillary palpi with a pointed tuft of hair from extremity; frons with a sharp tuft; antennæ of male almost simple; tibiæ smoothly scaled. Forewing with the costa arched at base then nearly straight, the outer margin excurved below apex then excised to

Cataprosopus monstrosus, ♂, ½.

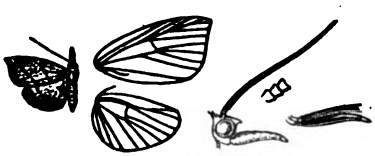
outer angle; male with a glandular swelling at base of costa below fringed with long hair; vein 3 from far before angle of cell; 4, 5 from angle; 6 from just below upper angle; 7, 8, 9, 10 stalked; 11 free. Hindwing with the outer margin slightly excised between veins 6 and 2; vein 3 from before angle of cell; 4, 5, 6 and 7 stalked.

Type. †Cataprosopus monstrosus, Butl., Trans. Ent. Soc., 1881, p. 590 . . . . . Japan.

Genus Trieropis.

Trieropis, Meyr., Trans. Ent. Soc., 1886, p. 218.

Palpi porrect, rostriform, downcurved, extending about four times length of head and thickly scaled, hollowed out to receive the long brush like maxillary palpi; frons produced to a flat



Trieropis nesias, ♂, ½.

projection: antennæ of male thickened and annulate; tibiæ with the spurs long and even. Forewing with the apex produced to a

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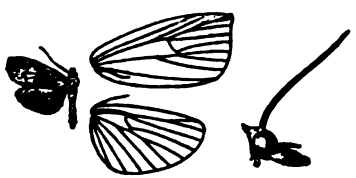
point, the outer margin excised below it; veins 3, 4, 5 from angle of cell; 6 from upper angle; 7, 8, 9, 10 stalked; 11 free. Hindwing with veins 3, 4 from angle of cell; 5 from above angle; 6, 7 from upper angle.

Type. †TRIEROPIS NESIAS, Meyr., Trans. Ent. Soc., 1886, p. 218 . . . . . Tonga.

Genus TRICHOPHYSETIS.

Trichophysetis, Meyr., Trans. Ent. Soc., 1884, p. 287.
Callinaias, Swinh., Trans. Ent. Soc., 1890, p. 286.
Crasigenes, Meyr., Trans. Ent. Soc., 1894, p. 476.
Alpherakia, Rag., Ann. Ent. Soc. Fr., 1890, p. 520.

Palpi porrect, about twice as long as head and thickly tufted with hair hiding the 3rd joint; maxillary palpi with a long



Trichophysetis nigricincta, ♂, ½ (from Moths Ind., vol. iv.).

pointed tuft of hair from extremity extending nearly as far as the labial palpi; frons rounded; antennæ thickened and flattened; legs with the spurs long and equal. Forewing with the apex rounded; veins 3, 4 from angle of cell; 5 from above angle; 7, 8, 9, 10 stalked, or 7 absent, or 10 from cell. Hindwing with vein 5 from above angle of cell, which is short; 6, 7 from upper angle.

Sect. I. (*Trichophysetis*).—Hindwing with veins 3, 4 from cell.

A. Forewing with vein 7 present.

a. Forewing with vein 10 stalked with 7, 8, 9.

Type. (1). †TRICHOPHYSETIS CRETACEA, Butl., Ill. Het., iii., p. 75, pl. 59, fig. 8 . . . Amur, Japan, Australia, Norfolk, Ill.
Paraponyx obnubilalis, Christ., Bull. Mosc., lvi., p. 32.
Trichophysetis neophyla, Meyr., Trans. Ent. Soc., 1884, p. 287.

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b. Forewing with vein 10 from cell.

(2). TRICHOPHYSETIS NIGRIPALPIS, Warr., A. M. N. H. (5), xvii., p. 149 . . . . Assam.

B. Forewing with vein 7 absent.

(3). TRICHOPHYSETIS NIGRIDISCALIS, Warr., A. M. N. H. (6), xvi., p. 470 . . Assam.

Section II. (*Callinaias*). — Hindwing with veins 3, 4 stalked.

(4). †TRICHOPHYSETIS NIGRICINCTA, Hmpsn., Ill. Het., ix., p. 180, pl. 174, fig. 15 . . Assam, Ceylon.

(5). †TRICHOPHYSETIS GRACILENTALIS, Swinh., Trans. Ent. Soc., 1890, p. 287, pl. 8, fig. 6 N.-E. India, Burma.

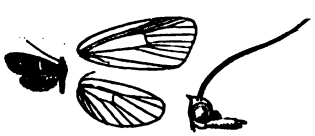
(6). †TRICHOPHYSETIS MICROSPILA, Meyr., Trans. Ent. Soc., 1894, p. 477 . . . . Sambawa.

(7). TRICHOPHYSETIS FUMILAUTA, Warr., A. M. N. H. (6), xvii., p. 465 . . . . Assam.

Genus ISCHNOSCOPA.

Ischnoscopa, Meyr., Trans. Ent. Soc., 1894, p. 464.

Palpi porrect, thickly scaled and extending twice the length of head; maxillary palpi triangularly dilated with scales; frons rounded; antennæ laminate; tibiæ with the spurs nearly equal. Forewing with veins 3, 4, 5 well separated at origin; 6 from well



Ischnoscopa chalcozona, ♂, ¾.

below upper angle; 7 absent; 8, 9 stalked; 10, 11 free. Hindwing with veins 3, 4 well separated at origin; 5 absent; 6, 7 from upper angle, 7 anastomosing with 8.

Type. †ISCHNOSCOPA CHALCOZONA, Meyr., Trans. Ent. Soc., 1894, p. 464 . . . . . Sambawa.

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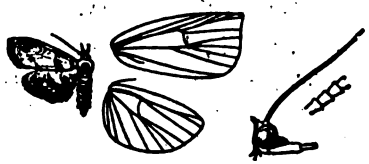
Genus Hendecasis.

Hendecasis, Hmpsn., Moths of India, vol. iv., p. 140 (1896).

Palpi porrect, straight and nearly naked, about three times length of head, the 2nd joint long, the 3rd well developed ; maxillary palpi triangularly scaled ; frons rounded ; antennæ annulate



Hendecasis duplifascialis, ♂, ⅔ (from Moths Ind., vol. iv.).

and somewhat thickened. Forewing with the apex acute ; the outer margin excurved at middle ; veins 3, 4, 5 from angle of cell ; 6 from upper angle : 7 absent ; 8, 9, 10 stalked. Hindwing with veins 3, 4, 5 from angle of cell ; 6, 7 from upper angle.

Type. (1). †Hendecasis duplifascialis, Hmpsn., Ill. Het., viii., p. 141, pl. 156, fig. 18 . . W. Africa, India, Ceylon.

(2). †Hendecasis fulvalis, Hmpsn., Ill. Het., ix., p. 180, pl. 174, fig. 7. . . . . Ceylon.

(3). †Hendecasis apiciferalis, Wlk., xxxiv., 1236 . . . . . China.

Genus Pleonectoides.

Pleonectoides, Hmpsn., Ill. Het., viii., p. 134 (1891).

Palpi porrect, rostriform, projecting about twice the length of head, the 2nd joint thickly scaled, the third hidden by hair ; maxillary palpi dilated with scales ; frons oblique ; antennæ annulated with rings

Pleonectoides vinacea, ♂, ½ (from Moths Ind., vol. iv.).

at the joints ; legs long and slender, the outer spurs about half the length of inner ; abdomen with lateral tufts towards extremity. Forewing long and narrow ; vein 3 from angle of cell ; 4, 5 on a long stalk ; 6 from below upper angle ; 7, 8, 9, 10 stalked, and 11

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closely approximated to them. Hindwing narrow; vein 3 from angle of cell; 4, 5 on a long stalk; the cell short; 6, 7 stalked.

Type. (1). †PLEONECTOIDES VINACEA, Hmpsn., Ill. Het., viii., p. 134, pl. 155, p. 19. . . . S. India.

(2). °PLEONECTOIDES SERICEA, Hmpsn., Moths of India, vol. iv., p. 141 . . . . Assam, Sambawa.

Genus BURATHEMA.

Burathema, Wlk., xxvii., 19 (1863).

Palpi porrect, straight, and extending about twice the length of head, the 3rd joint prominent; maxillary palpi triangularly scaled; frons rounded; antennæ of male very much thickened and flattened, and roughly scaled; tibiæ with the spurs long and even.

Burathema divisa, ♂, †.

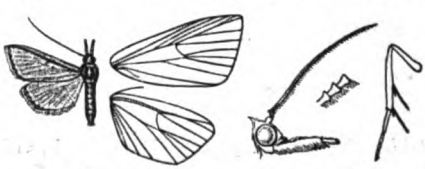
Forewing with the apex slightly produced and acute; vein 3 from well before angle of cell; 4, 5 separate at origin; 6 from below upper angle; 7, 8, 9, 10 stalked; 11 free. Hindwing with veins 3, 4, 5 well separated at origin; 6, 7 form upper angle.

Type. †BURATHEMA DIVISA, Wlk., xxvii, 19 . . . Borneo.

Genus MYRMIDONISTIS.

Myrmidonistis, Meyr., Trans. Ent. Soc. 1887, p. 196.

Palpi porrect, straight, projecting about two and a half times the length of head, and thickly fringed above and below with hair; maxillary palpi dilated with scales; frons flat and oblique;



Myrmidonistis hoplora, ♂, †.

antennæ of male annulate and ciliated, the base of shaft excised and contorted; hind tibiæ with the outer spurs minute. Forewing with veins 3, 4, 5 from angle of cell; 6 from upper angle;

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7, 8, 9 stalked; 10, 11 free. Hindwing with the outer margin straight from apex to vein 2, then truncate; veins 3, 4, 5 from angle of cell; 6, 7 from upper angle.

Type. °MYRMIDONISTIS HOPLORA, Meyr., Trans. Ent. Soc., 1887, p. 197 . . . . . Australia.

Genus PARACHMIDIA, nov.

Palpi porrect, downcurved, extending about twice the length of head, the 2nd joint angled with scales above, the 3rd long; maxillary palpi long and filiform; frons with a tuft of hair; antennæ of male ciliated. Forewing of male with a hyaline fovea in cell; the costa arched towards apex, which is rectangular; vein 3 from before angle of cell; 4, 5 stalked; 6 from upper angle; 7 absent; 8, 9, 10 stalked; 11 from cell. Hindwing with vein 3 from angle of cell; 4, 5 stalked; 6, 7 stalked, 7 anastomosing moderately with 8.

Type. †PARACHMIDIA FERVIDALIS, Wlk., xxxiv., 1461. St. Domingo.
Scopula prodigalis, Wlk., xxxiv., 1461.

Genus ROSTRIPALPUS.

Rostripalpus, Hmpsn., Moths of India, vol. iv., p. 142 (1896).

Palpi rostriform, downcurved, thickly scaled and extending about the length of head; maxillary palpi minute and filiform; frons

Rostripalpus longipennis, ♀, ⅔ (from Moths Ind., vol. iv.).

with a slight tuft; antennæ of female minutely ciliated; tibiæ with the spurs long. Forewing very long, narrow and produced at apex; vein 3 from angle of cell; 4, 5 stalked; 10, 11 free. Hindwing with vein 3 from angle of cell; 4, 5 stalked; 6, 7 from upper angle, 7 anastomosing strongly with 8.

Type. †ROSTRIPALPUS LONGIPENNIS, Hmpsn., Ill. Het., viii., p. 128, pl. 154, fig. 20. . . . . Nilgiris.

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Genus Syntonarcha.

Syntonarcha, Meyr., Proc. Linn. Soc. N. S. W., 1890, p. 1107.

Palpi porrect, downcurved, extending about twice the length of head, the 2nd joint fringed with hair above and below, the 3rd slightly fringed below: maxillary palpi triangularly scaled; frons with a conical prominence; antennæ nearly simple; tibiæ with the outer spurs about half the length of inner. Forewing with the costa highly arched; median and subcostal nervures closely

Syntonarcha iriastis, ♂, ♀.

approximated for three-fourths length, then expanding to form end of cell; veins 2 and 3 much curved, the latter from long before end of cell: 4, 5 well separated at origin; 6 from upper angle; 7, 8, 9 stalked; 10 from well before end of cell; 11 much curved. Hindwing with vein 3 from near end of cell; 4, 5 approximated for some distance; 6, 7 stalked.

Type. Syntonarcha iriastis, Meyr., Proc. Linn. Soc. N. S. W., 1890, p. 1107 . . . . . Australia.

Genus Centropseustis.

Centropseustis, Meyr., Proc. Linn. Soc. N. S. W., 1890, p. 1105.

Palpi rostriform and downcurved, thickly scaled and extending about twice the length of head; maxillary palpi minute and fili-

Centropseustis astrapora, ♂, ♀.

form; frons with a tuft of hair; antennæ of male minutely serrate and ciliated; tibiæ smooth. Forewing with veins 3, 4, 5, well

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separated at origin ; 6 from upper angle ; 10 anastomosing with 7, 8, 9 ; 11 free. Hindwing with vein 3 from before angle of cell ; 4, 5 from angle ; 6, 7 stalked.

Type. CENTROPSEUSTIS ASTRAPORA, Meyr., Proc. Linn. Soc. N. S. W., 1890, p. 1106 . . . . . Australia.

Genus ŒNOGENES.

Œnogenes, Meyr., Trans. Ent. Soc., 1884, p. 75.

Palpi porrect, extending about the length of head and fringed with long hair below ; maxillary palpi filiform ; frons rounded ; antennæ of male strongly ciliated ; tibiæ fringed with hair on outer

Œnogenes fugalis, ♂, ½.

side. Forewing with the costa arched towards apex ; vein 3 from before angle of cell ; 4, 5 from angle ; 6 from upper angle ; 7, 8, 9 stalked ; 10, 11 free. Hindwing with vein 3 from near angle of cell ; 4, 5 from angle ; 6, 7 from upper angle.

Type. ŒNOGENES FUGALIS, Feld., Reis. Nov., pl. 134, fig. 37 . . . . . Australia, Tasmania.

Genus COTACHENA.

Cotachena, Moore, Lep. Ceyl., iii., p. 275 (1885).
Mesothyris, Warr., A. M. N. H. (6), ix., p. 300 (1892).

Palpi porrect, triangularly scaled, the 3rd joint hidden by hair ; maxillary palpi filiform ; frons rounded ; antennæ of male with

Cotachena histricalis, ♂, ½ (from Moths Ind., vol. iv.).

long cilia ; hind tibiæ with the outer medial spur about half the length of inner. Forewing with the retinaculum formed by a

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large valve of scales from below median nervure in both sexes; the costa arched towards apex; the outer margin oblique; the cell short; vein 3 from 4 beyond angle; 5 closely approximated to 4 for half its length; 6 from upper angle; 10, 11 free. Hindwing with the cell very short; vein 3 from angle of cell; 4, 5 approximated for about one-fourth length; 6, 7 from upper angle, 7 anastomosing strongly with 8.

Type. (1). †Cotachena histricalis, Wlk., xviii., 655. Hmpsn., Ill. Het., ix., pl. 172, fig. 5. †*Archernis pubescens*, Warr., A. M. N. H. (6), ix., p. 300. China, India, Ceylon.

(2). †Cotachena trinotata, Butl., A. M. N. H. (5), xx., p. 122. *Cotachena peractalis*, Warr., A. M. N. H. (6), xvii., p. 465. Tenimber, Dili Solomons.

(3). †Cotachena aluensis, Butl., A. M. N. H., 1887, p. 123. *Cotachena fenestralis*, Warr., A. M. N. H. (6), xvi., p. 470. Queensland, Solomons.

Genera *Auctorum*.

Imerina mabillalis, Rag., Ann. Soc. Ent. Fr., 1890, p. 96, and Mon. Phyc., pl. iv., fig. 6. Madagascar.

Nymphicula stipalis, Snell., Midd. Sum., p. 78, pl. v., fig. 11. Sumatra.

Nymphicula infuscalis, Snell, Tijd. v. Ent., xxiii., p. 246, & xxvii., pl. v., fig. 6. Celebes.

Nymphicula acuminatalis, Snell., Tijd. v. Ent., xxiii., p. 246, & xxvii., pl. v., fig. 7. Celebes.

Subfamily Pyralinæ.

Proboscis usually well-developed; maxillary palpi present and usually filiform. Forewing with vein 7 stalked with 8, 9. Hindwing with the median nervure non-pectinate; vein 8 f[illegible].

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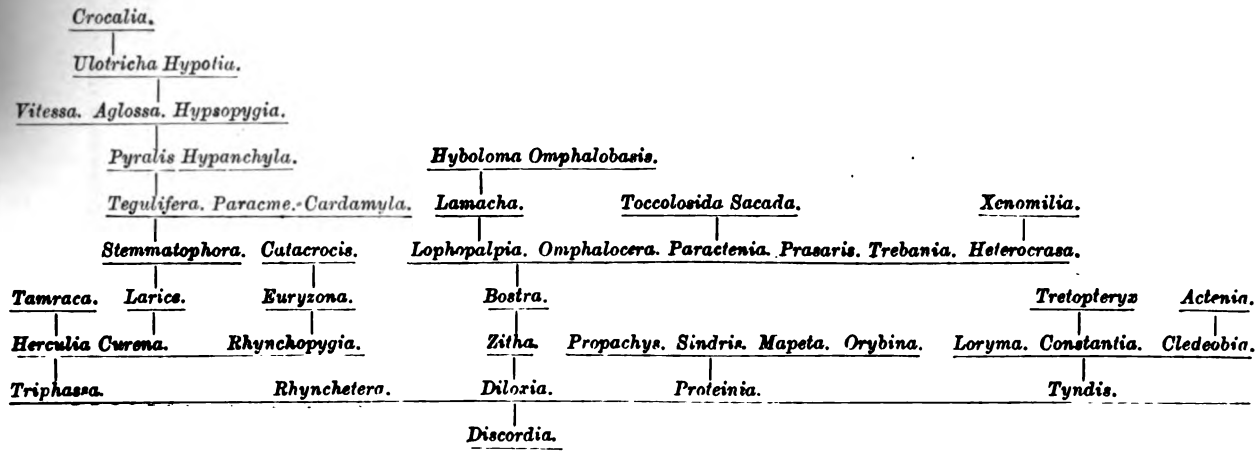
Phylogeny of the Pyralinæ.



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Key to the Genera.

A. Hind tarsi with no tuft of hair on 1st joint.
a Maxillary palpi long and triangularly scaled; palpi long, upturned or straight and porrect, the 3rd joint long and acuminate; an ennse of male pectinated . . . . . 38. *Sindris.*
b Maxillary palpi filiform, except in some genera with downcurved palpi.
a^1 Palpi with the 2nd and 3rd joints upturned.
a^2 Proboscis absent or minute.
a^3 Forewing with vein 9 stalked with 7, 8; hindwing with vein 4 present.
a^4 Forewing with vein 7 from 8 before 9.
a^5 Palpi with no tuft of hair in front of 2nd joint . . . . . 5. *Aglossa*
b^5 Palpi with a tuft of hair in front of 2nd joint . . . . . 4. *Hypotia*
b^4 Forewing with vein 7 from 8 after 9 . 3. *Ulotricha.*
b^3 Forewing with vein 9 from cell; hindwing with vein 4 absent . . . 2. *Crocalia.*
b^2 Proboscis well developed.
a_3 Abdomen long and dilated at extremity; antennæ of male with short branches . 1. *Vitessa.*
b_3 Abdomen normal; antennæ of male ciliated . . . . . 7. *Pyralis.*
a^4 Hindwing with veins 4, 5 stalked
a^5 Forewing with vein 7 from 8 before 9.
b^5 Forewing with vein 7 from 8 after 9 . 6. *Hypsopygia.*
b^4 Veins 4, 5 of each wing approximated for about one-third length.
a^5 Forewing with the costa not excised . 9. *Tegulifera.*
b^5 Forewing with the costa excised at middle . . . . . 8. *Hypanchyla.*
c^4 Veins 4, 5 of neither wing approximated towards origin.
a^5 Forewing with vein 7 from 8 before 9.
a^6 Palpi with the 2nd joint reaching far above vertex of head . . 10. *Paracme.*
a^7 Palpi with the 2nd joint reaching vertex of head
a^8 Maxillary palpi well developed. 13. *Larice.*
b^8 Maxillary palpi minute.
a^9 Palpi broadly scaled in front. 12. *Stemmatophora.*
b^9 Palpi slender and smoothly scaled . . . . . 11. *Cardamyla.*
b^7 Palpi very short and not reaching vertex of head . . . . 14. *Curena.*
b^5 Forewing with vein 7 from 8 after 9.
a^6 Forewing with vein 11 anastomosing with 12 . . . . . 17. *Catacrocis.*
b^6 Forewing with vein 11 not anastomosing with 12 . . . . 18. *Eurysona.*
b^1 Palpi obliquely upturned, the 3rd joint porrect.
a^2 Forewing with veins 4, 5 approximated for about one-third length.
a^3 Proboscis well developed; antennæ of male ciliated . . . . . 16. *Herculia.*
b^3 Proboscis minute; antennæ of male with short branches . . . . . 15. *Tamraca.*
b^2 Forewing with veins 4, 5 not approximated towards origin.

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a^3 Forewing with vein 7 from 8 after 9 . . 19. *Rhynchopygia.*
b^3 Forewing with vein 7 from 8 before 9 . 20. *Triphassa.*
c^1 Palpi straight and porrect.
a^2 Veins 4, 5 of each wing approximated for about one third length.
a^3 Palpi with a long sharp tuft of hair at end of 2nd joint below . . . . . 42. *Loryma.*
b^3 Palpi with no tuft of hair on 2nd joint . 47. *Tyndis.*
b^2 Veins 4, 5 of neither wing approximated towards origin.
a^3 Maxillary palpi well developed; palpi about the length of head; forewing with vein 7 from 8 before 9 . . . . . 48. *Discordia.*
b^3 Maxillary palpi minute; palpi about two and a-half times length of head; forewing with vein 7 from 8 after 9 . . . . . 41. *Proteinia.*
d^1 Palpi rostriform and downcurved at extremity.
a^2 Forewing with vein 6 from the cell.
a^3 Palpi less than twice the length of head.
a^4 Maxillary palpi triangularly scaled.
a^5 Proboscis minute; palpi moderately scaled . . . . . 44. *Constantia.*
b^5 Proboscis well developed; palpi clothed with long hair . . . . . 43. *Tretopteryx.*
b^4 Maxillary palpi filiform and well developed; frons usually with a sharp tuft.
a^5 Veins 4, 5 of neither wing approximated towards origin.
a^6 Palpi fringed with long hair on 2nd joint below . . . . . 25. *Lophopalpia.*
b^6 Palpi not fringed with hair below.
a^7 Abdomen without dorsal tufts; forewing with the costa not arched at base . . . 34. *Bostra.*
b^7 Abdomen with dorsal tufts; forewing with the costa arched at base. . . . . 26. *Omphalocera.*
b^5 Veins 4, 5 of each wing approximated for about one-third length, or forewing with 4, 5 stalked . . 29. *Paractenia.*
c^4 Maxillary palpi minute.
a^5 Frons with a tuft of hair; proboscis minute . . . . . 35. *Zitha.*
b^5 Frons smooth; proboscis well developed.
a^6 Forewing with veins 4, 5 from angle of cell . . . . . 36. *Diloxia.*
b^6 Forewing with veins 4, 5 stalked . 27. *Toccolosida.*
b^3 Palpi more than twice the length of head.
a^4 Forewing with vein 7 from 8 before 9.
a^5 Maxillary palpi triangularly scaled.
a^6 Palpi fringed with hair below; proboscis minute.
a^7 Hindwing with veins 4, 5 well separated at origin . . . 46. *Cledeobia.*
b^7 Hindwing with veins 4, 5 from a point . . . . . 45. *Actenia.*
b^6 Palpi thickly fringed with hair above and below; proboscis well developed . . . . 24. *Lamacha.*
a^7 Forewing with vein 10 from the cell.

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b^7 Forewing with vein 10 stalked with 7, 8, 9 . . . . . 23. *Omphalobasis.*
b^5 Maxillary palpi filiform; frons with a sharp tuft; hindwing of male with a tuft of hair near inner margin above . . . . . 30. *Prosaris.*
c^5 Maxillary palpi minute; frons smooth; palpi with the 2nd joint short, the 3rd long, in male with a fringe of hair on inner side arising from a groove . . . . . 31. *Trebania.*
b^4 Forewing with vein 7 from 8 after 9 . 39. *Mapeta.*
b^2 Forewing with vein 6 stalked with 7, 8, 9.
a^3 Forewing with vein 7 from 8 after 9.
a^4 Forewing with the costa lobed near base . . . . . 32. *Xenomilia.*
b^4 Forewing with the costa evenly curved . 33. *Heterocrasa.*
b^3 Forewing with vein 7 from 8 before 9.
a^4 Forewing with vein 10 free . . . . 22. *Hyboloma.*
b^4 Forewing with vein 10 stalked with 6, 7, 8, 9 . . . . . 40. *Orybina.*
B. Hind tarsi with a large tuft of hair on 1st joint.
a Palpi long rostriform and fringed with hair in male, upturned in female. . . . . 21. *Rhynchetera.*
b Palpi long rostriform and smoothly scaled in both sexes; male with tufts of hair at end of 2nd and 3rd joints, forming a cavity . . 37. *Propachys.*
c Palpi short and straight, hardly reaching beyond the frontal tuft . . . . . 28. *Sacada.*

Genus Vitessa.

Vitessa, Moore, Lep. E. I. C., p. 299 (1858).

Palpi upturned, slender, and smoothly scaled, the 2nd joint reaching vertex of head, the 3rd long; maxillary palpi dilated with scales; antennæ of male bipectinate with the branches dilated at extremity, in female thickened and flattened; tibiæ slightly

Vitessa suradeva, ♂, ½ (from Moths Ind., vol. iv.).

fringed with hair; abdomen dilated at extremity and with large anal tuft, the claspers of male very large and usually protruded. Forewing long and narrow; the costa arched towards apex; vein 3 from near angle of cell; 4, 5 stalked in male, approximated in female; 9 given off from 8 after 7. Hindwing with vein 3 from near angle of cell; 4, 5 & 6, 7 stalked in male, 4, 5 approximated in female.

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Sect. I. Antennæ of male with very short branches.

(1). VITESSA NICOBARICA, Hmpsn., Moths of India, vol. iv., p. 146 . . . . . Nicobars.

Type. (2). VITESSA SURADEVA, Moore, Lep. E. I. C., p. 299, pl. 7*a*, fig. 7. . . . . India, Ceylon, Burma, Andamans, Borneo.
Vitessa formosa, Feld. Reis. Nov., pl. 137, fig. 1.
†*Vitessa rama*, Moore, Lep. Ceyl., iii., p. 256, pl. 178, fig. 7.

(3). VITESSA TERNATICA, Led., Wien Ent. Mon., 1863, p. 335, pl. 6, fig. 7 . . Ceram, Ternate.

(4). †VITESSA PYRALIATA, Wlk., xxxi., 220 . Celebes.

(5). VITESSA ZALMIRA, Cram., Pap. Exot. iv., p. 149, pl. 367, fig. 2 . . . . . Amboina, N. Hebrides.

Sect. II. Antennæ of male with longer branches.

(6). †VITESSA HEMIALLACTIS, Meyr., Trans. Ent. Soc., 1887, p. 19 . . . . . New Guinea.

(7). †VITESSA PLUMOSA, n. sp.

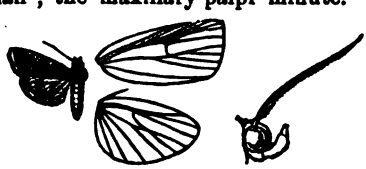
♂. Differs from *hemiallactis* in the white spot below the cell of forewing being bidentate; the discocellular patch much smaller, ovate, and separate from the elongate patch below vein 2; the veins of outer area much more strongly streaked with white. Hindwing with the base white; the marginal band tapering to anal angle.

Hab. Sambawa (Doherty). *Exp.* 44 mm.

Genus CROCALIA.

Crocalia, Rag., Ann. Soc. Ent. Fr., 1891, p. 634.

Differs from *Aglossa* in the 2nd joint of palpi being less broadly fringed with hair; the maxillary palpi minute. Forewing with



Crocalia aglossalis, ♂, ½ (from Moths Ind., vol. iv.).

veins 4, 5 stalked; 7, 8 on a long stalk; 9 from cell. Hindwing with veins 3 and 5 from angle of cell; 4 absent.

Type. CROCALIA AGLOSSALIS, Rag., Ann. Soc. Ent. Fr., 1891, p. 635 . . . . . N.-W. India.

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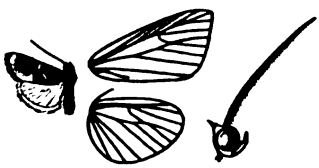
Genus Ulotricha.

Ulotricha, Led., Wien Ent. Mon., 1863, p. 341.

Proboscis extremely minute; palpi upturned, slender, and hardly reaching vertex of head; maxillary palpi minute and filiform; frons rounded; antennæ of male ciliated; tibiæ nearly



Ulotricha egregialis, ♂, ½.

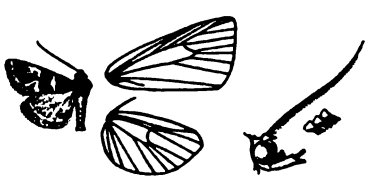
naked. Forewing with vein 3 from before angle of cell; 4, 5 from angle; 7 given off from 8 after 9; 10, 11 free. Hindwing with vein 3 from before angle of cell; 4, 5 stalked; 6, 7 from upper angle.

Type. Ulotricha egregialis, H. S., Schmett. Eur., p. 120, fig. 55 . . . . . S. Europe.
Ulotricha medusalis, Mill. Icon., iii., p. 242, pl. 127, figs. 4, 5.

Genus Hypotia.

Hypotia, Zell., Isis., 1847, p. 593.

Proboscis minute; palpi upturned, the 2nd joint widely separated from frons, and with a tuft of hair at extremity on outer side, the 3rd long, naked, and acuminate; maxillary palpi large



Hypotia corticalis, ♂, ½.

and triangularly scaled; frons rounded; antennæ with the basal joint dilated, a tuft of scales in front at extremity, the shaft annulate and strongly ciliated. Forewing with the costa nearly straight; vein 3 from near angle of cell; 4, 5 well separated at

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origin ; 6 from below upper angle ; 7 from 8 before 9 ; 10, 11 free. Hindwing with vein 3 from near angle of cell ; 4, 5 well separated at origin ; 6, 7 from upper angle.

Type. HYPOTIA CORTICALIS, Schiff., S. V., p. 123. Centr. Europe.

Genus AGLOSSA.

Aglossa, Latr., Précis Charact. Gen. Ins., p. 145, (1796).
Philotis, Rag., Ann. Soc. Ent. Fr., 1891, p. 81.
Agriope, Rag., Ann. Soc. Ent. Fr., 1894, p. 163.

Proboscis absent ; palpi upturned well in front of frons, the 2nd joint fringed with hair in front and reaching vertex of head, the 3rd long ; maxillary palpi dilated with scales at extremity ; antennæ of male ciliated and with long setiferous spines ; hind tibiæ fringed with hair on outer side towards base. Forewing long

Aglossa dimidiatus, ♂, ½ (from Moths Ind., vol. i.).

and narrow ; vein 3 from near angle of cell ; 4, 5 closely approximated or stalked ; 6 from upper angle. Hindwing with vein 3 from angle of cell ; 4, 5 closely approximated or stalked ; 6, 7 from upper angle.

Sect. I. Veins 4, 5 of each wing closely approximated for about one-third length.

Type. (1). AGLOSSA PINGUINALIS, Linn., Faun. Suec., 1350, p. 351 . . . . . Europe, Syria, Persia, Afghanistan, N.-W. Himalayas.
Aglossa asiatica, Ersch., Hor. Ent. Ross., viii., p. 317 (subsp.)
Aglossa aldidalis, Christ., Hor. Ent. Ross., x., p. 41 (subsp.).
Aglossa streatfieldii, Curt., pl. 455 (ab.).

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Sect. II. Veins 4, 5 of each wing stalked.

(2).	AGLOSSA CUPREALIS, Hübn., Verz., p. 348	Palæarctic, Nearctic, Neotropical, and Australian Regions.
	Aglossa domalis, Guen., Delt. and Pyr., p. 128.	
	†*Acrobasis inscultella*, Wlk., xxxv., 1712.	
	Tetralopha euthealis, Hulst., Tr. Am. Ent. Soc., xiii., p. 160.	
(3).	AGLOSSA DIMIDIATA, Haw., Lep. Brit., p. 372	Japan, China, S. India, Burma.
	†*Aglossa micalialis*, Wlk., xvii., 277.	
	Pyralis circularis, Motsch., Et., 1860, p. 37.	
	†*Aglossa achatina*, Butl., Ill. Het., iii., p. 72, pl. 58, fig. 6.	
(4).	AGLOSSA INCULTALIS, Zell., Lep. Caff., p. 21	S. Africa.
	Aglossa steralis, Feld., Reis. Nov., pl. 134, fig. 27.	
	†*Gelechia aglossella*, Wlk., xxxv., 1830.	
(5).	†AGLOSSA BASALIS, Wlk., xxxiv., 1250 .	S. Africa, Madagascar Persia.
	Philotis punctilimbalis, Rag., Ann. Soc. Ent. Fr., 1891, p. 82.	
(6).	°AGLOSSA RADAMALIS, Rag., Ann. Soc. Ent. Fr., 1891, p. 82	Madagascar.

Auctorum.

Aglossa exsucealis, Led., Wien Ent. Mon., 1863, p. 165, pl. 7, fig. 10	Beyrout.
Aglossa maceralis, Chretien, Le Naturaliste, 1891, p. 67	Beyrout.
Aglossa signicostalis, Staud., Hor. Ent. Ross., 1870, p. 180, pl. 2, fig. 6	Greece.
Agriope brabantii, Rag., Bull. Soc. Ent. Fr., 1884, p. 6, and 1888, pl. 6, fig. 6 ; and Ann. Soc. Ent. Fr., 1894, p. 163	France.
Aglossa simplicialis, Christ., Deutsche Ent. Zeit. Lep., vi., p. 96	Scharud.
Aglossa cestalis, Hulst., Smith, Z. List Lep. Bor. Am., p. 81	U. S. A.

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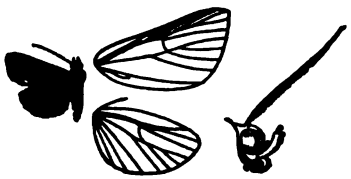
Genus Hypsopygia.

Hypsopygia, Hübn., Verz., p. 348 (1827.)



Hypsopygia mauritialis, ♂, ½ (from Moths Ind., vol. iv.).

Differs from *Pyralis* in the forewing having vein 9 given off from 8 before 7.

Type.	(1). Hypsopygia costalis, Fabr., Ent. Syst., No. 420	Europe, N. Asia, U. S. A.
	Pyralis fimbrialis, Schiff., Wien Verz., p. 124.	
	Pyralis aurotæniali, Chr., Bull. Mosc., 56, 1 (var.).	
	Pyralis hyllalis, Wlk., xvii., p. 265 (var.).	
	Pyralis rubrocilialis, Staud., Hor. Ent. Ross., 1870, p. 181.	
	(2). Hypsopygia mauritialis, Boisd., Faun. Madag., p. 119, pl. 16, fig. 8 . . .	Madagascar, China, India, Burma, Java, Celebes, Sumatra.
	†*Pyralis lucillalis*, Wlk., xvii., 268.	
	†*Pyralis regalis*, Wlk., xxxiv., 1241.	
	†*Pyralis ducalis*, Wlk., xxxiv., 1242.	
	Hypsopygia laticilialis, Rag., Ann. Ent. Soc. Fr., 1891, p. 28.	
	(3). †Hypsopygia postflava, Hmpsn., Ill. Het., ix., p. 159, pl. 171, fig. 22 . . .	N.-E. India, Ceylon.
	(4). †Hypsopygia regina, Butl., A. M. N. H. (6), ii., p. 452	Japan, Ganjam, Burma.

Genus Pyralis.

Pyralis, Linn. Syst. Nat., xii., p. 881 (1767).
Asopia, Zeit., Schmett. Eur., vii., 2, p. 316 (1828).
Sacatia, Wlk., xxvii., 123 (1863).
Eutrichodes, Warr., A. M. N. H. (6), vii., p. 498 (1891).
Therapne, Rag., Ann. Ent. Soc. Fr., 1891, p. 93.

Palpi upturned, the 2nd joint fringed with hair in front and reaching vertex of head, the 3rd of moderate length; maxillary

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palpi filiform ; antennæ of male ciliated ; tibiæ moderately hairy. Forewing with the apex rounded ; vein 3 from before angle of

Pyralis manihotalis, ♂, ½ (from Moths Ind., vol. iv.)

cell ; 4, 5 usually stalked ; 7 given off from 8 before 9 ; 10, 11 free. Hindwing with vein 3 from before angle of cell ; 4, 5 and 6, 7 stalked.

Sect. I. Forewing with veins 4, 5 approximated for a short distance.

(1). †PYRALIS RECISALIS, Swinh., P. Z. S., 1885, p. 866 . . . . . N.-W. and W. India.

Sect. II. Forewing with veins 4, 5 stalked.

(2). PYRALIS CUPRINA, Zell., Verh. Z.-B. Ver., 1872, p. 497 . . . . . U. S. A.

(3). °PYRALIS CAUSTICA, Meyr., Trans. Ent. Soc., 1884, p. 282 . . . . . Australia.

(4). PYRALIS ELECTALIS, Hulst., Tr. Am. Ent. Soc., 13, p. 146 . . . . . California.

(5). PYRALIS OBSOLETALIS, Mann., Wien Ent. Mon., 1864, p. 179, pl. 4 . . . S. Europe, Armenia, Aden.

Type. (6). PYRALIS FARINALIS, Linn. . Palæarctic, Æthiopian, Neoarctic, Neotropical regions, Japan, Afghanistan, Australia, New Zealand.
†*Pyralis fraterna*, Butl., Ill. Het., iii., p. 70, pl. 58, fig. 4.

(7). †PYRALIS DOMESTICALIS, Zell., Isis, 1847, p. 590 . . . . . Sicily.

(8). PYRALIS LIENIGIALIS, Zell., S. E. Z., 1843, p. 140 . . . . . N. Europe.

(9). PYRALIS PICTALIS, Curt., Brit. Ent., xi., p. 527 . . . . . Europe, W. Africa, Japan, India, Ceylon and Burma, Sumatra, Borneo, Gilbert Isl.
Pyralis pronoealis, Wlk., xix., 906.
Pyralis suggeralis, Wlk., xxxiv., 1237.
Pyralis proximalis, Wlk., Trans. Ent. Soc., 1862-4, p. 120.
†*Myelois bractiatella*, Wlk., xxvii., p. 36.

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†*Pyralis elachia*, Butl., Ill. Het., iii., p. 70, pl. 58, fig. 3.

(10). †PYRALIS RAVOLALIS, Wlk., xix., 898; Hmpsn., Ill. Het., ix., pl. 172, fig. 15 . Ceylon.
Pyralis œnoealis, Wlk., xix., 907.

(11). °PYRALIS FUNEBRALIS, Warr., A. M. N. H. (6), xvi., p. 464 . . . . . Assam.

(12). PYRALIS ELONGALIS, Koll., Hüg. Kasch, iv., p. 493 . . . . . N.-W. Himalayas.
Pyralis mensalis, Guen., Delt. and Pyr., p. 120.
†*Pyralis marmorea*, Butl., Ill. Het., vii., p. 91, pl. 134, fig. 10.

(13). PYRALIS OCELLALIS, Led., Wien Ent. Mon., vii., p. 391, pl. 7, fig. 9 . . . . Arabia.

(14). PYRALIS MANIHOTALIS, Guen., Delt. and Pyr., p. 121 . . . . . Neotropical, Oriental, and Australian regions.
†*Asopia vetusalis*, Wlk., xix., 831.
†*Pyralis gerontesalis*, Wlk., Cat., xix., p. 896; Moore, Lep. Ceyl., iii., pl. 178, fig. 6.
†*Sacatia laudatella*, Wlk., xxvii., 124.
†*Pyralis despectalis*, Wlk., xxxiv., 1243.
†*Pyralis miseralis*, Wlk., xxxiv., 1244.
Pyralis achatina, Butl., Ent. Mo. Mag., xiv., p. 49.

(15). †PYRALIS ALBILAUTALIS, Warr., A. M. N. H., (6) vii., p. 496 . . . . . Natal.

(16). †PYRALIS FUMIPENNIS, Butl., Ill. Het., vii., p. 91, pl. 134, fig. 11 . . . . . N.-W. Himalayas, Ceylon.
†*Pyralis minimalis*, Hmpsn., Ill. Het, ix., p. 159, pl. 171, fig. 18.

(17). PYRALIS SUBRESECTALIS, Snell., Trans. Ent. Soc., 1890, p. 565 . . . . . Sikhim.

(18). PYRALIS REGALIS, Schiff., Wien Verz., p. 124 . . . . . S. Europe, Siberia, Japan, N.-W. Himalayas.
Pyralis pulchellalis, Mill., Cat. Lep. Alpes-Marit., 1873, p. 221.
†*Pyralis princeps*, Butl., Ill. Het., vii., p. 91, pl. 134, fig. 12.

(19). PYRALIS PERVERSALIS, H. S., iv., p. 123, fig. 6 . . . . . E. Europe, Armenia.
Pyralis lucidalis, Ev., Faun. Ural, p. 466.

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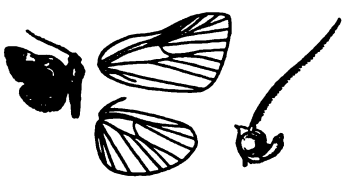
Auctorum.

Pyralis rubellalis, Zell., Lep. Caff., p. 20 . . S. Africa.
Pyralis secretalis, Walleng., Œfv. ak. Forh., xxii., 1, p. 122 . . . . . S. Africa.
Pyralis saturalis, Wlk., xix., 892 ; Cram., iv. pl. 348, U . . . . . Surinam.

Genus Hypanchyla.

Hypanchyla, Warr., A. M. N. H. (6) vii., p. 498 (1891).

Palpi upturned, reaching just above vertex of head ; maxillary palpi filiform ; frons rounded ; antennæ of male ciliated ; hind tibiæ with slight tuft of hair at base on outer side. Forewing with the costa excised at middle, deeply in male, slightly in female,



Hypanchyla maricalis, ♂, ½.

vein 3 from near angle of cell ; 4, 5 approximated for some distance ; 7 given off from 8 before 9 ; 10, 11 curved. Hindwing with vein 3 from near angle of cell ; 4, 5 approximated for a short distance ; 6, 7 from upper angle.

Sect. I. Forewing with one large excision in costa.

Type. (1). †Hypanchyla maricalis, Wlk., xix., 910 . Borneo.
Pyralis ? lebonalis, Wlk., xix., 910.

Sect. II. Forewing with five small excisions in costa.

(2). °Hypanchyla devialis, Wlk., xxxiv., 1239 Borneo.

Genus Tegulifera.

Tegulifera, Saalm., Ber. Senck. Ges., 1879–80, p. 305.
Peucela, Rag., Ann. Soc. Ent. Fr., 1891, p. 47.

Palpi upturned, the 2nd joint thickly scaled and reaching vertex of head, the 3rd short ; maxillary palpi minute ; antennæ of male

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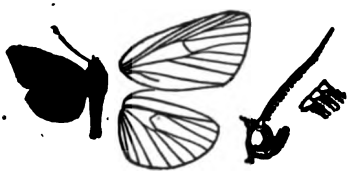
serrate and fasciculate; tibiæ moderately hairy, the spurs long. Forewing rather long and narrow; vein 3 from before end of cell; 4, 5 approximated for nearly one-third length, rarely stalked;



Tegulifera faviusalis, ♂, ½ (from Moths Ind., vol. iv.).

7, 8, 9 stalked; 10, 11 free. Hindwing with vein 3 from angle of cell; 4, 5 approximated for about one-third length; 6, 7 shortly stalked.

Sect. I. (*Tegulifera*).—Patagia of male extending well beyond metathorax.

Type. (1). TEGULIFERA RUBICUNDALIS, Saalm., Ber. Senck. Ges., 1880, p. 305 . . . Madagascar.
†*Tegulifera sanguinea*, Warr., A. M. N. H., (6) viii., p. 68.

(2). TEGULIFERA PSAMATHOPIS, Meyr., Trans. Ent. Soc., 1894, p. 11 . . . . Burma.

(3). TEGULIFERA RESECTALIS, Led., Wien Ent. Mon., 1863, p. 343, pl. 7, fig. 6 . . Brazil, Argentina.
Asopia vernacutalis, Berg., Boll. Ac. Cord., i., p. 157.

Sect. II. (*Peucela*).—Patagia of male not extending beyond metathorax.

(4). TEGULIFERA FAVIUSALIS, Wlk., xix., 907 . N.-W. Himalayas, N.-E. India, Borneo.
Pyralis drapesalis, Wlk., xix., 909.
Pyralis nonusalis, Wlk., xix., 909.
†*Pyralis platymitris*, Butl., P. Z. S., 1883, p. 166.
Pyralis pallivittata, Moore, Lep. Atk., p. 206.
Orthopygia atomosalis, Warr., A. M. N. H. (6), xvi., p. 465.
Peucela rubrifuscalis, Warr., A. M. N. H. (6), xvi., p. 461.

(5). †TEGULIFERA PALLIDIBASALIS, Hmpsn., Moths of India, vol. iv., p. 153 . . Nilgiris.

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(6). †TEGULIFERA CASTANEALIS, Hmpsn., Moths of India, vol. iv., p. 153 . . . Bhután.
(7). TEGULIFERA ROSEALIS, Hmpsn., Moths of India, vol. iv., p. 153. . . . . N.-E. India.
(8). °TEGULIFERA RUFIFASCIALIS, Hmpsn., Moths of India, vol. iv., p. 154 . . Assam.
(9). TEGULIFERA SUBOLIVESCENS, Warr., A. M. N. H. (6), xvi., p. 464 . . . . Assam, Ceylon.

Auctorum.

Tegulifera tristiculalis, Saalm., Ber. Senck. Ges., 1879, p. 306 . . . . . Madagascar.
Tegulifera albostriyalis, Saalm., Ber. Senck. Ges., 1879, p. 386 . . . . . Madagascar.
Peucela fuscolimbalis, Rag., Bull. Soc. Ent. Fr., 1888, p. 138 . . . . . Tunis.

Genus PARACME.

Paracme, Led., Wien Ent. Mon., 1863, p. 338.

Palpi upturned, long, the 2nd joint reaching well above vertex of head, the 3rd well developed; maxillary palpi long and filiform; form rounded; antennæ of male minutely ciliated; tegulæ of male reaching beyond metathorax; tibiæ nearly smoothly scaled. Fore-

Paracme racilialis, ♂, ½.

wing with the apex somewhat rounded; vein 3 from before angle of cell; 4, 5 from angle; 7 given off from 8 before 9; 10, 11 free. Hindwing with vein 3 from near angle of cell; 4, 5, from angle; 6, 7 from upper angle.

Type. †PARACME RACILIALIS, Wlk., xix., 899 . . China.
Paracme insulsalis, Led., Wien Ent. Mon., 1863, p. 339, pl. 6, fig. 11.

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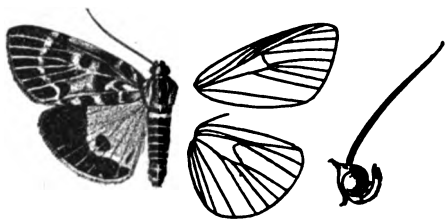
Genus Cardamyla.

Cardamyla, Wlk., xvii., 282 (1859).

Proboscis strong; palpi upturned, slender, and smoothly scaled, the 2nd joint reaching vertex of head, the 3rd well developed; maxillary palpi filiform; frons hairy; antennæ thickened; tibiæ



Cardamyla carinentalis, ♂, ½.

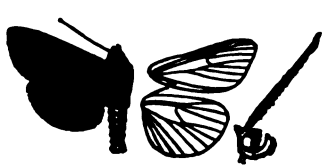
thickly scaled; male with the anal tuft and claspers large. Forewing with veins 3, 4, 5 from angle of cell; 6 from upper angle; 7 given off from 8 before 9; 10, 11 free. Hindwing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Type. †Cardamyla carinentalis, Wlk., xvii, 283, Led., Wien Ent. Mon., 1863, pl. 6, fig. 9 . . Australia.

Genus Stemmatophora.

Stemmatophora, Guen., Delt. and Pyr., p. 129 (1854).
Maradana, Moore, Lep. Ceyl., iii., p. 57 (1884).
Koremalepis, Hmpsn., Ill. Het., viii., p. 129 (1891).

Palpi upturned and reaching vertex of head, the 2nd joint fringed with hair in front, the 3rd minute; maxillary palpi minute;



Stemmatophora tactilis, ♂, ½ (from Moths Ind., vol. iv.).

antennæ of male with fascicles of long cilia; tibiæ somewhat hairy, the outer spurs short. Forewing short and broad, the apex

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rectangular; vein 3 from before angle of cell; 4, 5 from angle; 7, 8, 9 stalked; 10, 11 free. Hindwing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Sect. I. (*Stemmatophora*).—Male with the tegulæ hardly reaching beyond metathorax.

Type. (1). STEMMATOPHORA COMBUSTALIS, F. R., pl. 93, fig. 1 . . . . . S. Europe, Syria.
Pyralis lucidalis, Tr., vii., p. 151.
Pyralis rubidalis, Dup., viii., 233, 7, p. 345.

(2). †STEMMATOPHORA PALLIDELLA, Hmpsn., Moths of India, vol. iv., p. 155 . . Ceylon.

(3). °STEMMATOPHORA CARNEALIS, Hmpsn., Moths of India, vol. iv., p. 155 . . Burma.

(4). †STEMMATOPHORA PSEUDAGLOSSA, Hmpsn., Moths of India, vol. iv., p. 155 . . Ceylon.

(5). †STEMMATOPHORA OLEAGINA, Warr., A. M. N. H. (6), vii., p. 497 (♀) . . . Natal.

(6). †STEMMATOPHORA SANGUIFUSA, Hmpsn., Moths of India, vol. iv., p. 155 . . Ceylon.

(7). STEMMATOPHORA ALBIGUTTATA, Warr., A. M. N. H. (6), vii., p. 496 . . . Japan, Assam.

(8). *STEMMATOPHORA HERCULIALIS, Hmpsn., Moths of India, vol. iv., p. 156 . . Assam.

(9). †STEMMATOPHORA COSTINOTALIS, Hmpsn., Moths of India, vol. iv., p. 156 . . Sikhim.

(10). STEMMATOPHORA FUSCIBASALIS, Snell, Tijd. v. Ent., xxiii., p. 199, and xxvi., pl. 6, fig. 3, 3*a*. . . . . Formosa.
Pyralis umbrosalis, Swinh., Trans. Ent. Soc., 1890, p. 291 . . . . . Mysore, Burma, Celebes.

(11). †STEMMATOPHORA RIVULATA, Moore, Lep. Ceyl., iii., p. 58, pl. 150, fig. 14 . . Ceylon.

(12). *STEMMATOPHORA RECTISECTALIS, Warr., A. M. N. H. (6) xvii, p. 460 . . . S. India.

Sect. II. (*Coremalepis*).—Male with the tegulæ extending well beyond the metathorax.

(13). †STEMMATOPHORA TACTILIS, Swinh., Trans. Ent. Soc., 1890, p. 290 . . . . India, Burma.
Koremalepis scopula, Hmpsn., Ill. Het., viii., p. 129, pl. 154, figs. 2, 15.

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(14). STEMMATOPHORA BICOLORALIS, Leech, Entom., 1889, p. 65, pl. 4, fig. 17. . . Japan, W. India.
†*Pyralis dulciculalis*, Swinh., P.Z.S., 1889, p. 418; Hmpsn., Ill. Het., viii, pl. 156, fig. 13.

(15). †STEMMATOPHORA LATICINCTA, Hmpsn., Moths of India, vol. iv., p. 57 (♀). . . N.-W. Himalayas.

(16). †STEMMATOPHORA VALIDA, Butl., A. M. N. H. (5), iv., p. 451 . . . . Japan, China.

(17). †STEMMATOPHORA MONOSTÆCHALIS, Warr., A. M. N. H. (6), vii, p. 497 . . . N.-W. Himalayas.

Sect. III. Male with the patagia extending almost to end of abdomen.

(18). °STEMMATOPHORA PUNCTIMARGINALIS, Hmpsn., Moths of India, vol. 4, p. 157 Burma.

Genus LARICE.

Larice, Rag., Ann. Ent. Soc. Fr., 1891, p. 640.

Proboscis well developed; palpi upturned, the 2nd joint fringed with long hair in front and reaching vertex of head, the 3rd long and naked; maxillary palpi well developed and triangularly scaled; antennæ of male bipectinated, with short branches ciliated; tibiæ

Larice phycidalis, ♂, ½ (from Moths Ind., vol. iv.).

slightly hairy. Forewing long and narrow; vein 3 from before angle of cell; 4, 5 from angle; 6 from below upper angle; 7, 8, 9 stalked; 10, 11 free. Hindwing with vein 3 from near angle of cell; 4, 5 from angle.

Type, LARICE PHYCIDALIS, Guen., Delt. and Pyr., p. 121 N.-W. Himalayas, Burma.
†*Larice swinhœi*, Rag., Ann. Soc. Ent. Fr., 1891, p. 640.

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Genus Curena.

Curena, Wlk., xxxiv., 1253 (1865).

Palpi upturned, short, and not reaching vertex of head; maxillary palpi tufted with hair; frons rounded; antennæ of male with long cilia; tegulæ of male reaching beyond metathorax; mid and hind tibiæ fringed with hair on outer side. Forewing with the costa somewhat excised from near base to near apex, where it is

Curena externalis, ♂, ½.

highly arched; vein 3 from before angle of cell; 4, 5 from angle 7 given off from 8 before 9; 10, 11 free. Hindwing with vein 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Type. †Curena externalis, Wlk., xxxiv., 1253 . Australia.

Genus Tamraca.

Tamraca, Moore, Lep. Ceyl., iii., p. 554 (1887).

Proboscis minute; palpi oblique, the 3rd joint porrect, thickly clothed with hair, and reaching well beyond the minute maxillary palpi and sharp frontal tuft; antennæ of male with short fas-

Tamraca torridalis, ♂, ½ (from Moths Ind., vol. iv.).

ciculate branches; patagia of male reaching end of metathorax, with a tuft of long hair below them; tibiæ hairy. Forewing with the costa nearly straight; the outer margin somewhat excised towards outer angle; vein 3 from before angle of cell; 4, 5 approximated for one-third length; 7 given off from 8 before 9;

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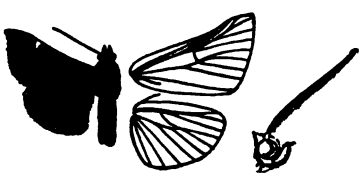
10, 11 free. Hindwing with vein 3 from near angle of cell; 4, 5, hardly approximated at base; 6, 7 from upper angle.

Type. TAMRACA TORRIDALIS, Led., Wien Ent. Mon., 1863, p. 342, pl. 6, fig. 15; Moore, Lep. Ceyl., iii., pl. 215, figs. 7, 8. China, India, Ceylon, Burma, Java, Celebes.
†*Varnia incerta*, Wlk., xxxiii., 829.

Genus HERCULIA.

Herculia, Wlk., xix., 807 (1859).
Cisse, Wlk., xxvii., 125 (1863).
Buzala, Wlk., xxvii., 129.
Ocrasa, Wlk., xxxiv., 1212 (1865).
Lixa, Wlk., xxxiv., 1254.
Bejuda, Wlk., xxxiv., 1273.
Pseudasopia, Grote, Bull. Buff. Soc., i., p. 172 (1873).
Orthopygia, Rag., Ann. Soc. Ent. Fr., 1891, p. 29.
Dolichomia, Rag., Ann. Soc. Ent. Fr., 1891, p. 30.
Trichauctenia, Warr., A. M. N. H. (6), ix., p. 173 (1891).

Palpi thickly scaled, the 2nd joint upturned and reaching vertex of head, the 3rd porrect; antennæ of male minutely ciliated; the patagia of male reaching beyond the metathorax; tibiæ moderately



Herculia ignifualis, ♂, ♀ (from Moths Ind., vol. iv.).

hairy. Forewing with vein 3 from end of cell; 4, 5 approximated for about one-third length; 7 given off from 8 before 9; 10, 11 free. Hindwing with vein 3 from angle of cell; 4, 5 approximated for about one-third length; 6, 7 stalked.

Sect. I. Patagia of male reaching slightly beyond metathorax.

A. (*Ocrasa*). Fore femora of male with a tuft of hair from base.

(1). †HERCULIA ALBIDALIS, Wlk., xxxiv., 1212 . Australia.
†*Spilodes rhodocryptalis*, Wlk., xxxiv, 1474.

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(2). HERCULIA DECOLORALIS, Led., Wien Ent. Mon., 1863, p. 343, pl. 6, fig. 10 (♀) . Australia.

(3). †HERCULIA REPITITA, Butl., A. M. N. H. (5), xx., p. 116 . . . . . Solomons, Tahiti.

B. Fore femora of male without tuft of hair.

a. (*Herculia*). Forewing with the apex not produced upwards, the outer margin evenly curved.

(4). HERCULIA GLAUCINALIS, Linn., Syst. Nat., x., p. 328 . . . . . Europe, Japan.
Phalæna nitidalis, Fabr., Ent. Syst., No. 373.
Euclita incalidalis, Hübn., Veon., p. 347.
†*Pyralis yokohamæ*, Butl., A. M. N. H. (5), iv., p. 452.

(5). †HERCULIA IMBECILIS, Moore, Lep. Ceyl., iii., p. 264 . . . . . India, Ceylon, Java, Celebes, Fiji.
†*Pyralis incongrua*, Butl., P. Z. S., 1886, p. 383, pl. 35, fig. 5.

(6). °HERCULIA DATAMES, Druce, Biol. Centr. Am. Het., ii., p. 201, pl. 60, fig. 11 . . Mexico.

(7). †HERCULIA TENUIS, Butl., P. Z. S., 1888, p. 681 . . . . . Brazil, S. Africa, Formosa, India, Ceylon.

(8). †HERCULIA RUDIS, Moore, Lep. Atk., p. 205 (♀) . . . . . Sikhim.

(9). †HERCULIA NANNODES, Butl., Ill. Het., iii., p. 71, pl. 58, fig. 5 . . . . . Japan, China.

(10). †HERCULIA HELENENSIS, Woolast., A. M. N. H. (5), iii., p. 331 . . . . Madagascar, St. Helena.
Asopia hæmatinalis, Saalm., Ber. Senck. Ges., 1880, p. 295.

(11). †HERCULIA NIGRIVITTA, Wlk., xxvii., 125 . Burma, Borneo.
†*Buzala fuscicosta*, Wlk., xxvii., 130.
Bejuda costigeralis, Wlk., xxxiv., 1273.
Euclita fuscicostalis, Snell., Tijd. v. Ent., xxvi., p. 122, pl. 6, fig. 4.

(12). HERCULIA NOSTRALIS, Guen., Delt. and Pyr., p. 122 . . . . . Venezuela.
Asopia graafialis, Snell., Tijd. v. Ent., xviii., p. 189, pl. xi., fig. 1.

(13). HERCULIA BINODULALIS, Zell., Verh. Z.-B. Wien, 1872, p. 501 . . . . .

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(14). HERCULIA INCARNATALIS, Zell., Isis., 1847, p. 591 . . . . . S. Europe.
Pyralis lucidalis, Dup., Lep. Fr., viii., p. 198, pl. 223, fig. 3.

(15). HERCULIA FULVOCILIALIS, Dup., Lep. Fr., viii., p. 375, pl. 236, fig. 6 . . . . S. Europe, Armenia.

(16). †HERCULIA THYMETUSALIS, Wlk., xviii., 565 . . . . . U. S. A.
†*Asopia devialis*, Grote, Bull. Buff. Soc. N. Sc., ii., p. 219.

(17). †HERCULIA COHORTALIS, Grote, Bull. Buff. Soc. N. Sc., ii., p. 233 . . . . . U. S. A.

(18). †HERCULIA PLACENS, Butl., Ill. Het., iii., p. 72, pl. 58, fig. 10. . . . . Japan.

(19). †HERCULIA JAPONICA, Warr., A. M. N. H., 1891, i., p. 499 . . . . . Japan.

(20). HERCULIA INTERMEDIALIS, Wlk., Trans. Ent. Soc. Lond. (3), 1, p. 118 . . . U. S. A., W. Indies.
†*Pyralis sodalis*, Wlk., Char. Undescr. Het., p. 60.
†*Asopia squamealis*, Grote, Bull. Buff. Soc. N. Sc., i., p. 172.

(21). HERCULIA OLINALIS, Guen., Delt. and Pyr., p. 118 . . . . . U. S. A.
Asopia trentonalis, Led., Wien Ent. Mon., 1863, p. 343, pl. 7, fig. 2.

(22). †HERCULIA PLANALIS, Grote, N. Am. Ent., i., p. 95 (♀) . . . . . U. S. A.
Asopia anniculalis, Hulst., Tr. Am. Ent. Soc., 1886, p. 147.
Asopia occidentalis, Hulst., Tr. Am. Ent. Soc., 1886, p. 147.

(23). †HERCULIA HIMONIALIS, Zell., Verh. Z.-B. Wien, xxii., p. 500. . . . . U. S. A.

(24). HERCULIA RUBIDALIS, Schiff., Wien Verz., p. 124 . . . . . S.-E. Europe.
Pyralis lucidalis, Hübn., Pyr., fig. 161.

(25). †HERCULIA ALBOLINEALIS, Hmpsn., Ill. Het., viii., p. 130, pl. 154, fig. 10 . . . Nilgiris.

(26). HERCULIA PERNIGRALIS, Rag., Ann. Soc. Ent. Fr., 1891, p. 32 . . . . . Ceylon, Burma.

(27). †HERCULIA AUROCILIALIS, Hmpsn., Ill. Het., viii., p. 130, pl. 154, fig. 19 . . . Nilgiris.

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Type. (28). †Herculia ochreicilia, Hmpsn., Ill. Het., viii., p. 130, pl. 154, fig. 3 . . . . Nilgiris.

(29). †Herculia martialis, Wlk., xvii., 270 . Ceylon,
†*Herculia bractealis*, Wlk., xix., 808; Hmpsn., Ill. Het., ix., pl. 172, fig. 2. Borneo.

(30). †Herculia igniflualis, Wlk., xvii., 268; Hmpsn., Ill. Het., ix., pl. 172, fig. 10 . Nilgiris, Ceylon, Borneo.
†*Pyralis dorcasalis*, Wlk., xvii., 271.
† „ *bealealis*, Wlk., xix., 902.
Asopia hampsonialis, Snell., Tijd. v. Ent., xxxviii., p. 110.

(31). †Herculia suffusalis, Wlk., xxxiv., 1235 India, Burma.

(32). †Herculia pelasgalis, Wlk., xvii., 269 . China.

b. (*Lixa*). Forewing with the apex produced upwards, the outer margin recurved at middle.

(33). °Herculia productalis, Wlk., xxxiv., 1254 Borneo.

Sect. II. (*Dolichomia*). Patagia of male reaching far beyond metathorax.

(34). †Herculia dharmsalæ, Butl., Ill. Het., vii., p. 92, pl. 134, fig. 13 . . . N.-W. Himalayas.

(35). †Herculia fuscalis, Hmpsn., Ill. Het., viii., p. 128, pl. 154, fig. 5 . . . Nilgiris.

(36). †Herculia sericea, Warr., A. M. N. H. (6), vii., p. 499 . . . . . Sikhim.

(37). †Herculia tabidalis, Warr., A. M. N. H. (6), vii., p. 499 . . . . . Peru.

(38). °Herculia bistonalis, Wlk., xix., 1002 . Borneo.

Auctorum.

Pyralis cyanealis, Mab., Bull. Soc. Philom., iii., 143 Madagascar.

Asopia amœnalis, Mœschl., Verh. Z.-B. Wien, 1881, p. 418 . . . . . Surinam.

„ *cæsalis*, Zell., Lep. Caffr., p. 22 . . Natal.

„ *caustica*, Meyr., Trans. Ent. Soc., 1884, p. 282 . . . . . Australia.

„ *semnialis*, Feld., Reis. Nov., pl. 136, fig. 19 Brazil.

„ *tripartitalis*, H. S., Lep. Cuba, p. 16. . Cuba.

„ *kacheticalis*, Christ., Deutsche Ent. Zeit. Lep., vi., p. 96 . . . . . Transcaucasus.

„ *subregalis*, Snell., Tijd. v. Ent., xxxviii., p. 111 . . . . . Java.

„ *divugalis*, Snell., Tijd. v. Ent., xxxviii., p. 112 . . . . . Java.

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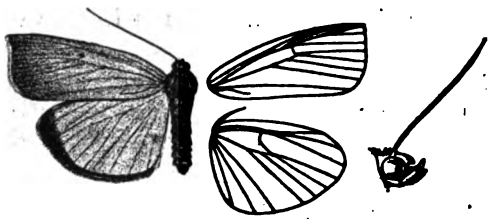
Genus Catacrocis.

Catacrocis, Rag., Ann. Soc. Ent. Fr., 1891, p. 107.

Palpi upturned, the 2nd joint hairy and reaching vertex of head, the 3rd well developed and naked; maxillary palpi filiform; frons with a tuft of hair; antennæ of male simple; tibiæ with a tuft of hair on outer side at base. Forewing with the costa



Catacrocis lithosialis, ♀, ½.

straight; the apex rectangular; vein 3 from before angle of cell; 4, 5 from angle; 6 from upper angle; 7 given off from 8 after 9; 10 free; 11 anastomosing with 12. Hindwing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 stalked.

Type. Catacrocis lithosialis, Rag., Ann. Soc. Ent. Fr., 1891, p. 107 . . . . . Brazil.

Genus Euryzona.

Euryzona, Hmpsn., Moths of India, vol. iv., p. 163 (1896).

Palpi upturned and somewhat oblique, reaching beyond the sharp frontal tuft, the 2nd joint thickly scaled; maxillary palpi filiform; antennæ of male ciliated, the basal joint dilated; tibiæ of male

Euryzona latifascia, ♂, ½ (from Moths Ind., vol. iv.).

with the outer spurs short. Forewing with the apex rounded; the inner margin lobed near base; vein 3 from near angle of cell; 4, 5 well separated; 6 from upper angle; 7 from 8 after 9; 10, 11 free.

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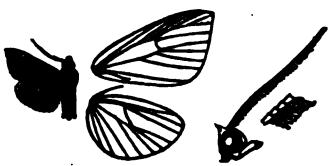
Hindwing with vein 3 from near angle of cell ; 4, 5 well separated ; 6, 7 from upper angle.

Type. †EURYZONA LATIFASCIA, Hmpsn., Ill. Het., viii., p. 129, pl. 154, fig. 8 . . . . . W. India.

Genus RHYNCHOPYGIA.

Rhynchopygia, Hmpsn., Moths of India, vol. iv., p. 163 (1896).

Palpi oblique and thickly scaled, the 3rd joint porrect ; maxillary palpi minute and filiform ; a slight frontal tuft ; antennæ of male minutely serrate and fasciculate ; tibiæ slightly hairy. Fore-



Rhynchopygia purpureorufa, ♂, ½ (from Moths Ind., vol. iv.).

wing with vein 3 from near angle of cell ; 4, 5 from angle ; 7 from 8 after 9. Hindwing with vein 3 from near angle of cell ; 4, 5 from angle ; 6, 7 from upper angle.

Type. °RHYNCHOPYGIA PURPUREORUFA, Hmpsn., Moths of India, vol. iv., p. 164 . . . . . Ceylon.

Genus TRIPHASSA.

Triphassa, Hübn., Samml. Exot. Schmett., p. 26 (1818).

Palpi oblique, the 2nd joint thickly scaled, the 3rd porrect and minute ; maxillary palpi filiform ; a sharp frontal tuft ; antennæ

Triphassa vulsalis, ♂, ¾ (from Moths Ind., vol. iv.).

of male with a slight process at end of basal joint ; the shaft set on at an angle and with long cilia ; mid tibiæ fringed with hair.

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Forewing with vein 3 from before angle of cell; 4, 5 from angle; 7 from 8 before 9; 10, 11 free. Hindwing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Sect. I. Patagia of male bearing tufts of long scales, reaching to middle of abdomen.

(1). †TRIPHASSA METAXANTHA, Hmpsn., Moths of India, vol. iv., p. 164 . . . Ceylon.

(2). †TRIPHASSA OCHREALIS, Hmpsn., Ill. Het., ix., p. 158, pl. 171, fig. 5 . . . Ceylon.

(3). †TRIPHASSA VULSALIS, Wlk., xviii., 671; Hmpsn., Ill. Het., ix., p. 171, fig. 9 . Ceylon.

(4). †TRIPHASSA IMBUTALIS, Wlk., xxxiv., 1283; Moore, Lep. Ceyl., iii., pl. 178, fig. 9 (♀) Ceylon.

(5). †TRIPHASSA LUTECILIALIS, Hmpsn., Moths of India, vol. iv., p. 165 (♀) . . . Ceylon.

Sect. II. Patagia of male not reaching beyond metathorax.

A. Mid tibiæ of male moderately fringed with hair.

Type. (6). TRIPHASSA STALACHTIS, Hübn., Exot. Schmett., 26, 75, figs. 149, 150 . . S. Africa.
†*Scopula guttalis*, Wlk., xxxiv., 1470.

(7). †TRIPHASSA ALBIALIS, Wlk., xviii., 640 . S. Africa.
†*Corgatha vexatalis*, Wlk., xxxiv., 1176.
Pyralis humeralis, Wlk., xxxiv., 1233.

(8). †TRIPHASSA ZEUXOALIS, Wlk., xxvii., 135 . Ceylon.

(9). †TRIPHASSA XYLINALIS, Swinh., P. Z. S., 1885, p. 865, pl. 57, fig. 17 . . . W. India, Ceylon.

(10). †TRIPHASSA FLAVIFRONS, Warr., A. M. N. H. (6), ix., p. 173 . . . . . W. Africa.

B. Mid tibiæ of male fringed with very long hair on inner side.

(11). †TRIPHASSA BILINEATA, Moore, Lep. Ceyl., iii., p. 555, pl. 215, fig. 11 . . . Himalayas, Khásis, Ceylon.
Comaria unilinealis, Warr., A. M. N. H. (6), xvii, p. 462.

Genus RHYNCHETERA.

Rhynchetera, Hmpsn., Moths of India, vol. iv., p. 166 (1896).

♂. Palpi porrect. Downcurved at extremity, and extending rather more than twice the length of head, the 2nd joint fringed

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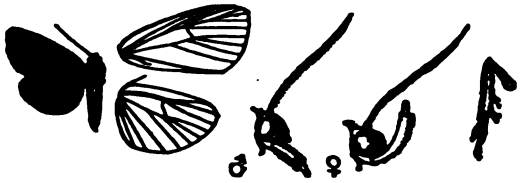
with hair above and below ; maxillary palpi dilated with hair ; frons with a sharp tuft ; antennæ serrate and fasciculate ; hind tibiæ fringed with long hair, the 1st joint of tarsus with a large tuft of hair on outer side. Forewing with the apex rectangular ;



Rhynchetera carnealis, ♂, ♀ (from Moths Ind., vol. iv.).

vein 3 from well before end of cell ; 4, 5 from angle ; 6 from upper angle ; 7 from 8 before 9 ; 10, 11 free. Hindwing with vein 3 from before angle of cell ; 4, 5 from angle ; 6, 7 from upper angle.

♀. With the palpi upturned and naked, the 2nd joint curved and reaching far above vertex of head.

Type. *Rhynchetera carnealis, Hmpsn., Moths of India, vol. iv., p. 166 . . . . . Assam.

Genus Hyboloma.

Hyboloma, Rag., Ann. Ent. Soc. Fr., 1891, p. 99.
Polycampsis, Warr., A. M. N. H. (6), xvii., p. 457 (1896).

Palpi porrect, extending about four times length of head, curved downwards and inwards, the 2nd joint fringed with hair below, the 3rd rounded and fringed above and below ; maxillary palpi

Hyboloma nummosalis, ♀, ♀ (from Moths Ind., vol. iv.).

large and triangularly scaled ; frons with a sharp tuft ; antennæ of female nearly simple ; tibiæ smoothly scaled. Forewing with the costa highly arched before middle, excised b[illegible] it, the apex produced and depressed ; the outer m[illegible] in e[illegible] below apex,

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excurved and somewhat angled at middle; vein 3 from before angle of cell; 4, 5 from angle; 6, 7, 8, 9 stalked; 10, 11 free. Hindwing with the outer margin slightly excised below apex; vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Sect. I. (*Polycampsis*).—Forewing of male with a glandular swelling at base of costa below.

(1). °HYBOLOMA LONGINASUS, Warr., A. M. N. H. (6), xvii., p. 458 . . . . . Assam.

Sect. II. (*Hyboloma*).—Forewing of male with no glandular swelling at base of costa.

Type. (2). HYBOLOMA NUMMOSALIS, Rag., Ann. Ent. Soc. Fr., 1891, p. 99, pl. 16, fig. 3 . Assam, Burma, Borneo.

Genus OMPHALOBASIS, nov.

Palpi downcurved, about two-and-a-half times length of head, the 2nd and 3rd joints thickly fringed with hair above and below;

Omphalobasis chalybopicta, ♂, ½.

maxillary palpi triangularly scaled; frons rounded; antennæ of male somewhat thickened and flattened; tibiæ fringed with rough hair. Forewing with the costa arched at base, then straight; the apex produced and acute; the outer margin highly excurved from below apex to vein 3; vein 3 from before angle of cell; 4, 5 from angle; 6 from upper angle; 7, 8, 9, 10 stalked; male with a glandular swelling at base of costa below, fringed with long hair. Hindwing with the outer margin nearly straight from apex to vein 2; veins 3, 4, 5 from angle of cell; 6, 7 stalked.

OMPHALOBASIS CHALYBOPICTA, Warr., A. M. N. H. (6), xvii., p. 452 . . . . . Assam.

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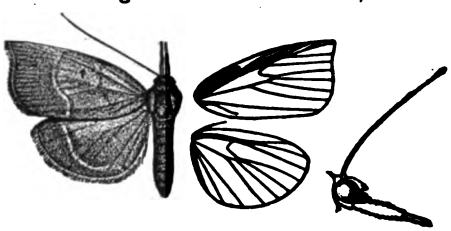
Genus Lamacha.

Lamacha, Wlk., xxvii., 8 (1863).
Diboma, Wlk., xxvii., 8.
Methora, Wlk., xxxiv., 1517 (1865).

Palpi porrect, downcurved, extending about three times length of head, and fringed with hair above and below; maxillary palpi triangularly scaled; proboscis well developed; frons with a sharp tuft; antennæ almost simple; tibiæ slightly hairy. Forewing broad, the costa arched at base, then nearly straight, the apex rectangular; the outer margin excurved at middle; vein 3 from before



Lamacha bilineolata, ♂, ♮.

angle of cell; 4, 5 slightly separated at origin; the discocellulars highly curved; 6 from upper angle; 7 from 8 before 9; 10, 11 free; male with a glandular swelling at base of costa below; the retinaculum hairy. Hindwing with veins 2 and 3 from near angle of cell; 4, 5 from angle; 6, 7 stalked.

Type. (1). †Lamacha bilineolata, Wlk., xxvii., 8 . China.
(2). †Lamacha abscissalis, Wlk., xxvii., 9 . Borneo.
(3). †Lamacha tortricalis, Wlk., xxxiv., 1518 Java.

Genus Lophopalpia, nov.

Palpi porrect, extending about the length of head, the 2nd joint fringed with long hair below extending to end of 3rd joint, which

Lophopalpia pauperalis, ♂, ♮.

is bent sharply down a[illegible] palpi f[illegible]
bo:cis minute; frons v [illegible]æ of [illegible]

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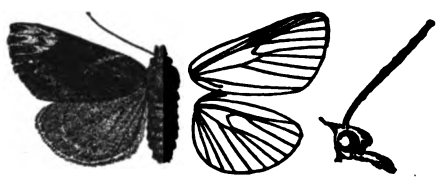
tibiæ fringed with hair on outer side ; claspers and anal tuft large. Forewing with the costa arched at base, then nearly straight ; male with a glandular swelling at base of costa below fringed with long hair ; vein 3 from near angle of cell ; 4, 5 from angle ; 6 from upper angle ; 7, 8, 9, 10 stalked ; 11 free. Hindwing with vein 3 from near angle of cell ; 4, 5 from angle ; 6, 7 shortly stalked.

Type. LOPHOPALPIA PAUPERALIS, Leech, Entom., xxii., 1889, p. 70, pl. iv., fig. 11 . . . . . Japan, Pulo Laut.

Genus OMPHALOCERA.

Omphalocera, Led., Wien Ent. Mon., 1863, p. 339.
Omphalomia, Swinh., A. M. N. H. (6), xiv., p. 140 (1894).

Proboscis well-developed ; palpi porrect, downcurved, thickly scaled and extending about the length of head ; maxillary palpi filiform ; frons with a sharp tuft ; antennæ thickened ; tibiæ slightly hairy ; abdomen with dorsal tufts. Forewing broad, the



Omphalocera accersita, ♀, ♮ (from Moths Ind., vol. iv.).

costa arched near base and towards apex which is rounded ; male with a glandular fold fringed with long hair at base of costa below ; vein 3 from before angle of cell ; 4, 5 from angle ; 6 from upper angle ; 7 from 8 before 9 ; 10, 11 free. Hindwing with vein 3 from near angle of cell ; 4, 5 from angle ; 6, 7 stalked.

Sect. I. (*Omphalocera*).—Antennæ of male with a sinus near base of shaft enclosing a vesicular tuft of scales.

Type. (1). OMPHALOCERA CARIOSA, Led., Wien Ent. Mon., 1863, p. 339, pl. 6, fig. 12 . . U. S. A.
(2). †OMPHALOCERA DENTOSA, Grote, Bull. U. S. Geol. Surv., vi., p. 272 (♀) . . . U. S. A.

Sect. II. (*Omphalomia*).—Antennæ of male with no sinus and tuft.

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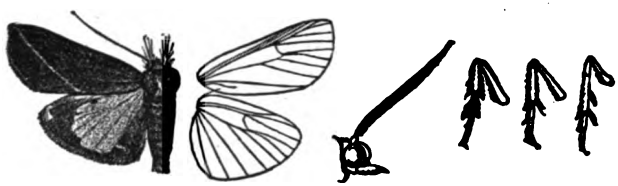
(3). †Omphalocera accersita, Swinh., A. M. N. H. (6), xiv., p. 140 . . . . N.-E. and W. India.

(4). °Omphalocera canosparsalis, Hmpsn., Moths of India, vol. iv., p. 168 (♀) . Burma.

Genus Toccolosida.

Toccolosida, Wlk., xxvii., 14 (1863).

Differs from *Sacada* in the palpi being smoothly scaled; the frons rounded; the antennæ minutely fasciculate and without the tuft on basal joint; male with a tuft of long hair arising from



Toccolosida rubriceps, ♂, ♮ (from Moths Ind., vol. iv.).

below the patagia; tibiæ and tarsi very slightly fringed with hair, the spurs minute. Forewing narrow, the outer margin with traces of angulation at vein 4. Hindwing with veins 3, 4 approximated towards origin.

Type. †Toccolosida rubriceps, Wlk., xxvii., 14 . . N.-E. India, Borneo.

Auctorum.

Toccolosida bilinealis, Snell., Tijd. v. Ent., 35, p. 154; and Jarb. Nass., 47, pl. 1, fig. 6 . . Java.

Genus Sacada.

Sacada, Wlk., Journ. Linn. Soc., vi., p. 136 (1862).
Sybrida, Wlk., xxxii., 465 (1865).
Paravetta, Moore, P. Z. S., 1865, p. 814.
Danaka, Moore, Lep. Atk., p. 71 (1879).
Xestula, Snell., Rom. Mem., ii., p. 195 (1885).

Palpi porrect fringed with long hair below and hardly reaching beyond the sharp frontal tuft; maxillary palpi filiform, antennæ with a tuft of hair from basal joint; tibiæ and proximal joint of hind tarsi fringed with long hair; m[illegible]ith a tuft of lo[illegible] hair from thorax below base of fore[illegible]wing long an[illegible]

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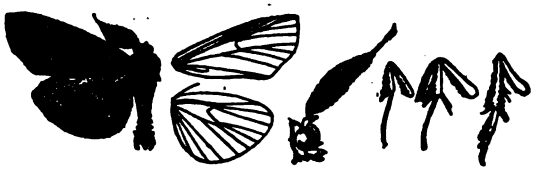
narrow, the apex somewhat produced and the outer margin oblique; veins 4, 5 usually stalked; 7 from 8 before 9; 10, 11 free. Hind-



Sacada discinota, ♂, ♀ (from Moths Ind., vol. iv.).

wing ample; veins 4, 5, usually on a short stalk; 6, 7, from upper angle.

Sect. I. Antennæ of male bipectinate with long branches to three-fourths length.

A. (*Sacada*). Forewing of moderate breadth, the outer margin evenly curved; female with veins 4, 5 of each wing approximated at base.

(1). †SACADA INORDINATA, Wlk., xxxii., 466 . Japan, Sikhim.
Datanoides approximans, Leech, P. Z. S., 1888, p. 636, pl. 32, fig. 4.

(2). †SACADA FASCIATA, Butl., E. M. M., xiv., 207 Amur, Japan.
Xestula miraculosa, Snell., Rom. Mem., ii., p. 195, pl. ii.

Type. (3). †SACADA DECORA, Wlk., Journ. Linn. Soc., vi., p. 136 . . . . . Borneo.

(4). °SACADA UNILINEALIS, Hmpsn., Moths of India, vol. iv., p. 170 . . . . Sikhim.

B. (*Paravetta*). Forewing narrow.

a. Forewing with the outer margin very slightly angled at vein 4.

(5). †SACADA DISCINOTA, Moore, P. Z. S., 1867, p. 814, pl. 43, fig. 3. . . . . N.-E. India.

(6). SACADA CONSTRICTALIS, Rag., Ann. Ent. Soc. Fr., 1891, p. 75, and 1890, pl. viii., fig. 10 Assam, Ceylon.

(7). †SACADA PALLESCENS, Hmpsn., Moths of India, vol. iv., p. 171 . . . . E. Himalayas.

(8). SACADA FLEXUOSA, Snell., Trans. Ent. Soc., 1890, p. 558 . . . . . N.-E. India Burma.
Sybrida inflammealis, Rag., Ann. Ent. Soc. Fr., 1891, p. 75, and 1890, pl. viii., fig. 9.

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b. Forewing with the outer margin more produced and angled at vein 4.

(9). †SACADA SIKKIMA, Moore, Lep. Atk., p. 70 Sikhim.

Sect. II. (*Danaka*).—Antennæ of male serrate and fasciculate; forewing narrow with the outer margin evenly curved.

(10). SACADA PYRALIFORMIS, Moore, Lep. Atk., p. 71, pl. 3, fig. 10 . . . . . E. Himalayas.

(11). †SACADA RUFINA, Hmpsn., Moths of India, vol. iv., p. 172. . . . . Bombay.

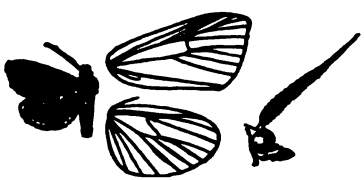
Auctorum.

Sybrida ragonotalis, Snell., Tijd. v. Ent., xxxv., p. 153; and Jarb. Nass., 47, pl. 1, fig. 9. Java.

Genus PARACTENIA.

Paractenia, Rag., Ann. Ent. Soc. Fr., 1891, p. 642.

Differs from *Bostra* in veins 4, 5 of each wing being approximated for about one-third length, or forewing with 4, 5 stalked.



Paractenia quisqualis, ♂, ♀ (from Moths Ind., vol. iv.).

Sect. I. Forewing with veins 4, 5 approximated.

A. Antennæ of male bipectinated for two-thirds length.

(1). †PARACTENIA RUBICUNDALIS, Swinh., P.Z.S., 1885, p. 864 . . . . . W. India.

(2). †PARACTENIA QUISQUALIS, Swinh., P. Z. S., 1885, p. 865, pl. 57, fig. 11 . . . Bombay.

B. Antennæ of male ciliated.

(3). PARACTENIA ALLUTALIS, Zell., Lep. Caffr., p. 18 . . . . . S. Africa.

Stemmatophora mucidalis, Guen., Delt. and Pyr., p. 130.

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†*Aglossa harpyialis*, Wlk., xvii., 276.
†*Scopula cleoalis*, Wlk., xviii., 789.
†*Nephopteryx rubiginalis*, Wlk., xxvii., 62.

(4). °PARACTENIA RUPTILINEALIS, Warr., A. M. N. H. (6), xvi., p. 466 (♀) . . . Assam.

(5). °PARACTENIA DECETIALIS, Druce, Biol.Centr. Am. Het., ii., p. 201, pl. 60, fig. 12 (♀). Mexico.

Sect. II. Forewing with veins 4, 5 stalked.

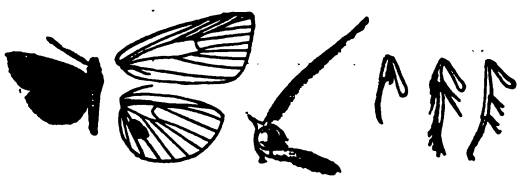
(6). PARACTENIA SEMIOCHREA, Warr., A. M. N. H. (6), xvi., p. 466 (♀) . . . Assam.

(7). °PARACTENIA PELLUCIDALIS, Warr., A. M. N. H. (6), xvii., p. 460 . . . . Assam.

Genus PROSARIS.

Prosaris, Meyr., Trans. Ent. Soc., 1894, p. 12.

Palpi curved downwards, more than twice the length of head and thickly scaled; maxillary palpi dilated and well developed; a sharp frontal tuft; proboscis small; antennæ of male with long cilia; tibiæ and proximal joints of tarsi fringed with hair; fore femora with a tuft of hair below. Forewing somewhat narrow,



Prosaris pernigralis, ♂, ½ (from Moths Ind., vol. iv.).

the apex produced and the outer margin oblique; veins 4, 5 well separated at origin; 7 from 8 before 9. Hindwing with vein 3 from near angle of cell; 4, 5 well separated at origin; 6, 7 from upper angle; male with a tuft of long scales on middle of vein 1 c. on upper side, and a bladder-like swelling at base of vein 8 below.

Type. PROSARIS PERNIGRALIS, Meyr., Trans. Ent. Soc., 1894, p. 12 . . . . . N.-E. India, Burma.

Genus TREBANIA.

Trebania, Rag., Ann. Ent. Soc. Fr., 1891, p. 645.

Proboscis well developed; palpi with the 2nd joint slightly curved upwards, the 3rd rostriform, downcurved, about three times

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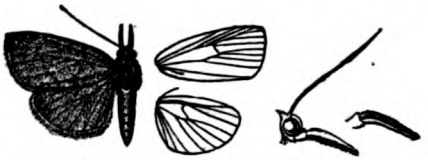
the length of head and with a thick fringe of downcurved iridescent hair springing from a groove on inner side; maxillary palpi filiform; frons rounded; antennæ of female nearly simple;



Trebania muricolor, ♂, ½ (from Moths Ind., vol. iv.).

tibiæ moderately hairy. Forewing short and broad; vein 3 from before angle of cell; 4, 5 from angle; 6 from upper angle; 7 from 8 before 9; 10, 11 free. Hindwing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 shortly stalked.

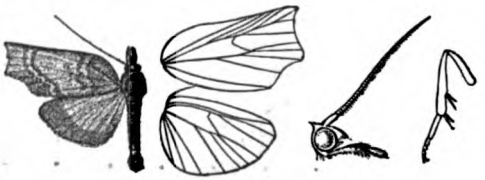
(1). †Trebania muricolor, Hmpsn., Moths of India, vol. iv., p. 174 . . . . N.-E. India.

Type. (2). °Trebania flavifrontalis, Leech, Entom., 1889, p. 108, pl. v., fig. 6 . . . China.

Genus Xenomilia.

Xenomilia, Warr., A. M. N. H. (6), xvii., p. 458 (1896).

Palpi downcurved extending about twice the length of head and fringed with scales above and below; maxillary palpi filiform; frons with sharp tuft; antennæ laminate, with the basal joint long; tibiæ smoothly scaled. Forewing of male with the costa very strongly lobed at base, then nearly straight, the apex produced and



Xenomilia humeralis, ♂, ½.

acute, the outer margin strongly falcate at vein 3; of female with the costa and outer margin evenly curved; vein 3 from before angle of cell; 4, 5 from angle; the discocellulars highly angled; 6, 7, 8, 9 stalked, 7 being given off nearer the apex than 9; 10, 11

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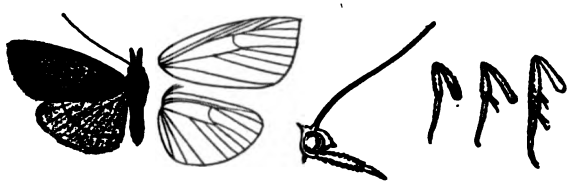
free. Hindwing with vein 3 from near angle of cell ; 4, 5 from angle ; 6, 7 stalked.

Type. XENOMILIA HUMERALIS, Warr., A. M. N. H. (6), xvii., p. 459 . . . . . Assam.

Genus HETEROCRASA.

Heterocrasa, Warr., A. M. N. H. (6), xvii., p. 459 (1896).

♀. Palpi downcurved, extending about three times length of head and thickly scaled ; maxillary palpi minute ; frons with a sharp tuft ; antennæ of female almost simple ; tibiæ and tarsi



Heterocrasa expansalis, ♀, ½.

moderately scaled ; vein 3 from below angle of cell ; 4, 5 from angle ; 6, 7, 8, 9 stalked, 7 being given off just beyond 9 ; 10, 11 free. Hindwing with vein 3 from well before angle of cell ; 4, 5 separate ; 6, 7 stalked.

Type. HETEROCRASA EXPANSALIS, Warr., A. M. N. H. (6), xvii., p. 459 . . . . . Assam.

Genus BOSTRA.

Bostra, Wlk., xxvii., 123 (1863).
Phasga, Wlk., xxvii., 127.
Scotomera, Butl., P. Z. S., 1881, p. 622.
Megalomia, Rag., Ann. Soc. Ent. Fr., 1891, p. 35.
Comaria, Rag., Ann. Soc. Ent. Fr., 1891, p. 639.
Paredra, Snell., Midd. Sum., iv. (1), 8, p. 60 (1892).
Scotomerodes, Rag., Ann. Soc. Ent. Fr., 1895, p. xcvii.
Stygiochroa, Rag., Ann. Soc. Ent. Fr., 1895, p. clxxi.

Palpi porrect, downcurved at extremity, and thickly clothed with hair ; maxillary palpi filiform ; a sharp frontal tuft usually present ; antennæ of male serrate amd fasciculate ; tibiæ moder-

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ately hairy. Forewing usually short and broad; veins 3 and 5 from close to angle of cell; 6 from upper angle; 7 from 8 before 9;

Bostra vibicalis, ♂, ½ (from Moths Ind., vol. iv.).

10, 11 free. Hindwing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Sect. I. Antennæ of male strongly serrated; forewing narrow.

(1). BOSTRA IMPERATRIX, Warr., A. M. N. H. (6), xvii., p. 462 . . . . . N.-E. India.

(2). †BOSTRA PALLIDICOSTA, Hmpsn., Ill. Het., ix., p. 158, pl. 172, fig. 17 . . . . Sikhim, Ceylon.

Sect. II. Antennæ of male with the serrations minute.

A. Forewing narrow.

(3). BOSTRA SUBUSTALIS, Led., Verh. Zool. Bot. Ges. Wien, 1855, p. 213, pl. 3, fig. 10 . N.-W. Himalayas.

B. Forewing broad.

a (*Bostra*). Patagia of male not extending beyond metathorax.

a^1. Frons with a sharp tuft.

(4). †BOSTRA MARGINATA, Wlk., xxxiii., 991 . Japan, India, Sumatra, Borneo.
†*Paleca rufescens*, Butl., A. M. N. H. (5), iv., p. 354.
Pyralis assamica, Moore, Lep. Atk., p. 205, pl. 7, fig. 5.
Paredra eogenalis, Snell., Tidj. v. Ent., xxvi., p. 120, pl. 6, figs. 1, 1*a*.

(5). BOSTRA VIBICALIS, Led., Wien Ent. Mon., 1863, p. 338, pl. 7, fig. 4 . . . India, Ceylon, Burma.
†*Pyralis roborealis*, Swinh., P. Z. S., 1885, p. 865, pl. 57, fig. 1.
†*Euclita fortis*, Butl., Ill. Het., vii pl. 134, fig. 14.

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†*Stemmatophora foliata*, Swinh., P. Z. S., 1887, p. 418, pl. 44, fig. 5.

(6). †BOSTRA SALMO, Hmpsn., Ill. Het., viii., p. 128, pl. 154, fig. 18 (♀); *id.*, ix., p. 157, pl. 171, fig. 6 (♂) . . . . . S. India, Ceylon.

(7). †BOSTRA ASTIGMA, Hmpsn., Ill. Het., ix., p. 157, pl. 171, fig. 12 . . . . . Ceylon.

(8). †BOSTRA DENTICULATA, Swinh., Trans. Ent. Soc., 1890, p. 290, pl. 8, fig. 7 . . Burma.
†*Stemmatophora duplicata*, Warr., A. M. N. H. (6), vii., p. 437.

(9). BOSTRA IGNEUSTA, Swinh., A. M. N. H. (6), xvi., p. 300. . . . . Khásis.

(10). †BOSTRA NOCTUITES, Butl., A. M. N. H., 1875, ii., p. 411 . . . . . S. Africa.

(11). †BOSTRA ALBILINEATA, Warr., A. M. N. H. (6), vii., p. 437 . . . . . Natal.

(12). †BOSTRA ILLUSELLA, Wlk., xxvii., 123; Hmpsn., Ill. Het., ix., pl. 172, fig. 19 . Ceylon.

(13). BOSTRA GNIDUSALIS, Wlk., xvii., 278 . N.-W. India,
†*Scotomera tristis*, Butl., P. Z. S., 1881, p. 623 Ceylon.

(14). †BOSTRA BALUX, Swinh., P. Z. S., 1884, p. 519, pl. 47, fig. 14 . . . . . Sind.

(15). †BOSTRA ARIDA, Butl., P. Z. S., 1881, p. 621 . . . . . Sind.

(16). †BOSTRA DIFFUSALIS, Wlk., xxvii., 127 . Borneo.

(17). †BOSTRA MELANTHALIS, Wlk., xvii., 271 . Borneo.

b[1]. (*Comaria*). Frons smooth and rounded.

a[2]. Antennæ of male normal.

(18). †BOSTRA CASTANOPTERA, Moore, Lep. Ceyl., iii., p. 260, pl. 178, fig. 7 . . . Ceylon.

b[2]. Antennæ of male with the basal joint very long, the shaft with long cilia, contorted, and with two teeth at middle.

(19). BOSTRA SUBVIRIDESCENS, Warr., A. M. N. H. (6), xvi., p. 466 . . . . Assam.

(20). BOSTRA FASCIALIS, Warr., A. M. N. H. (6), xvi., p. 465 . . . . . N.-E. India.

b. (*Megalomia*). Patagia of male extending far beyond metathorax, with large tufts of hair below them.

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a[1]. Mid tibiæ and first joint of tarsi smooth.

(21). *Bostra carnealis, Hmpsn., Moths of India, vol. iv., p. 179 . . . . . Burma.

b[1]. Mid tibiæ and first joint of tarsi in male fringed on inner side with long hair.

(22). †Bostra angulifascia, Moore, Lep. Atk., p. 206 . . . . . Sikhim.

Auctorum.

Arippara indicator, Wlk., Journ. Linn. Soc., vii., p. 74 . . . . . Borneo.
Stemmatophora bilineata, Cram., Pap. Exot., iv., p. 138, pl. 360, fig. 1.
Stemmatophora meridionalis, Moeschl., Surinam, iv., p. 27, pl. 18, fig. 27 . . . . . Surinam.
Stemmatophora vetustalis, Zell., Lep. Caffr., p. 17 S. Africa.
Stemmatophora exustalis, Guen., Delt. and Pyr., p. 130, pl. 10, fig. 1 . . . . . S. Africa.
Stemmatophora lateritialis, Guen., Delt. and Pyr., p. 130 . . . . . S. Africa.
Stemmatophora leonalis, Oberth., Bull. Soc. Ent. Fr., 1887, p. 76 ; and Et. Ent., xii., pl. vi., fig. 38 . . . . . Algeria.
Stemmatophora fracticornalis, Snell., Tijd. v. Ent., 1894, p. 6 . . . . . Java.
Stemmatophora vulpeculalis, Rag., Ann. Ent. Soc. Fr., 1891, p. 87 . . . . . Algeria.
Stemmatophora tacapealis, Rag., Ann. Ent. Soc. Fr., 1891, p. 83 . . . . . Tunis.
Stemmatophora cæsarealis, Rag., Ann. Ent. Soc. Fr., 1891, p. 88 . . . . . Armenia.
Scotomerodes syriacalis, Rag., Ann. Ent. Soc. Fr., 1895, p. xcvii. . . . . Syria.
Aporodes austautalis, Oberth., Et. Ent., vi., p. 93, pl. iii., fig. 7 ; (*Stygiochroa*) Rag., Ann. Ent. Soc. Fr., 1895, p.clxxi. . . . . Algeria.

Genus Zitha.

Zitha, Wlk., xxxiv., 1264 (1865).
Angenora, Rag., Ann. Ent. Soc. Fr., 1890, p. 80.
Oryctrocera, Rag., Ann. Ent. Soc. Fr., 1891, p. 51.

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Palpi porrect, downcurved at extremity, thickly scaled and extending about the length of head ; maxillary palpi minute and filiform ; proboscis minute ; frons with a tuft of hair ; antennæ of male minutely ciliated ; tibiæ hairy. Forewing with the costa

Zitha ignalis, ♂, ½.

arched towards apex which is rounded ; vein 3 from close to angle of cell ; 4, 5 well separated at origin ; 6 from upper angle ; 7 from 8 before 9 ; 10, 11 free. Hindwing with vein 3 from close to angle of cell ; 4, 5 from angle ; 6, 7 from upper angle.

Type. (1). ZITHA IGNALIS, Guen., Delt. and Pyr., p. 129 . . . . . S. Africa.
†*Zitha punicealis*, Wlk., xxxiv., 1264.

(2). ZITHA LAMINALIS, Guen., Delt. and Pyr., p. 129 . . . . . S. Africa.
†*Aglossa rufifualis*, Wlk., xxxiv., 1249.
Oryctrocera aurocupralis, Rag., Ann. Ent. Soc. Fr., 1891, p. 52.

(3). °ZITHA SUBCUPRALIS, Zell., Lep. Caffr., p. 20 Natal.
Angenora actenialis, Rag., Ann. Ent. Soc. Fr., 1890, p. 80.

Genus DILOXIA.

Diloxia, Hmpsn., Moths of India, vol. iv., p. 179 (1896).

Palpi rostriform, downcurved at extremity and reaching well beyond the frons which is rounded ; maxillary palpi minute ;

Diloxia fimbriata, ♂, ½ (from Moths Ind., vol. iv.).

...næ of male with long bristles and cilia ; build slight ; legs ...nd slender, the tibiæ smooth, the spurs long. Forewing

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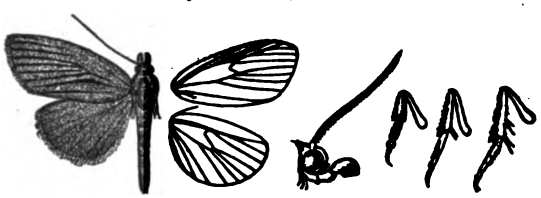
broad ; vein 3 from before angle of cell ; 4, 5 from angle ; 7 from 8 before 9 ; 10, 11 free. Hindwing with vein 3 from before angle of cell ; 4, 5 from angle ; 6, 7 from upper angle.

Type. †DILOXIA FIMBRIATA, Hmpsn., Moths of India, vol. iv., p. 180 . . . . . Nilgiris.

Genus PROPACHYS.

Propachys, Wlk., xxvii., 6 (1863).

Palpi porrect and curving downwards ; the end of the 2nd and 3rd joints tufted with long curved hair forming a cavity in male, in female longer and slightly fringed with hair; maxillary palpi minute and filiform ; proboscis well developed; frons rounded ; antennæ of male minutely ciliated ; male with a tuft of long hair



Propachys nigrivena, ♂, ♀ (from Moths Ind., vol. iv.).

from below the patagia ; tibiæ and 1st tarsal joints fringed with hair. Forewing with the apex rounded ; vein 3 from before angle of cell ; 4, 5 from angle ; 7 from 8 before 9 ; 10, 11 free. Hindwing with vein 3 from near angle of cell ; 4, 5 from angle ; 6, 7 stalked.

Type. †PROPACHYS NIGRIVENA, Wlk., xxvii., 7 . . China, N.-E. India.

Genus SINDRIS.

Sindris, Boisd., Faun. Madag., p. 122 (1833).
Episindris, Rag., Ann. Ent. Soc. Fr., 1891, p. 112.

Proboscis well developed ; maxillary palpi long and dilated with scales ; frons hairy ; antennæ of male bipectinate to three-fourths

Sindris sganzini, ♂, ♀.

length ; tibiæ fringed with hair ; male with the anal tuft and claspers large. Forewing with the costa arched ; the apex rounded ;

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vein 3 from angle of cell; 4, 5 stalked; 6 from upper angle; 7 given off from 8 before 9; 10, 11 free. Hindwing with vein 3 from near angle of cell; 4, 5 and 6, 7 shortly stalked.

Sect. I. (*Sindris*).—Palpi upturned, smooth, widely separated and extending well in front of frons, the 2nd joint reaching vertex of head, the 3rd long and acuminate.

Type. (1). SINDRIS SGANZINI, Boisd., Faun. Madag., p. 122, pl. 16, fig. 10 . . . . Delagoa Bay, Madagascar.

Sect. II. Palpi of male as in Sect. I.; of female straight and porrect, extending about three times length of head.

(2). †SINDRIS CERVINALIS, n. sp.

Head whitish, collar orange fulvous, thorax grey, abdomen yellow. Forewing uniform grey brown. Hindwing fulvous yellow, cilia of both wings whitish.

Hab. Accra, W. Africa. *Exp.* ♂ 24, ♀ 38 mm.

Sect. III. (*Episindris*).—Palpi of both sexes as in female of Sect. II.

(3). SINDRIS ALBIMACULALIS, Rag., Ann. Ent. Soc. Fr., 1891, p. 113 . . . . E. and W. Africa.

Genus MAPETA.

Mapeta, Wlk., xxvii., 17 (1863).
Homalochroa, Led., Wien Ent. Mon., 1863, p. 332.

Palpi porrect, slender, curved downwards and extending about twice the length of head, maxillary palpi filiform; proboscis well developed; frons rounded; antennæ simple; tibiæ smoothly scaled,

Mapeta xanthomelalis, ♂, ½.

the outer spurs about half the length of inner. Forewing with vein 3 from before angle of cell; 4, 5 from angle; 6 from upper

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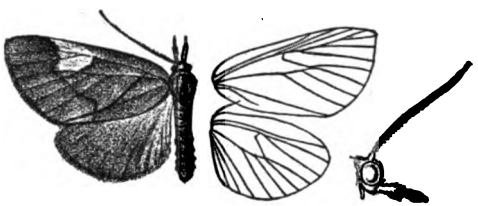
angle; 7 from 8 after 9; 10, 11 free. Hindwing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 stalked.

†MAPETA XANTHOMELAS, Wlk., xxvii., 17 . . W. Indies,
Homalochroa æstivalis, Led., Wien Ent. Mon., 1863, p. 332, pl. 6, fig. 3. S. America.

Genus ORYBINA.

Oryba, Wlk., xxvii., 10 (1863), preocc.
Orybina, Snell., Tijd. v. Ent., 1894, p. 5.

Palpi of male rostriform, about twice the length of head; the 3rd joint triangularly scaled, hollowed out inside, and with the apex very acute; in female more slender and three to four times the length of head; maxillary palpi minute in male, filiform and upturned in female; frons smooth; antennæ of male minutely



Orybina flaviplaga, ♀, ♮.

ciliated; tibiæ moderately hairy. Forewing with the costa arched near base and apex, and slightly excised at middle, the apex produced, the outer margin excised below apex, then excurved, and oblique towards outer angle; vein 3 from close to angle of cell; 4, 5 from angle; the discocellulars arising from the subcostal nervure at origin of vein 11, so that veins 6, 7, 8, 9, 10 are stalked. Hindwing with vein 3 from near angle of cell; 4, 5 from angle; 6, 7 shortly stalked; the costa excised at middle in male.

Type. (1). †ORYBINA FLAVIPLAGA, Wlk., xxvii., 11. . Himalayas,
(2). †ORYBINA PLANGONALIS, Wlk., xviii., 790. Burma.
Oryba conspicualis, Snell., Trans. Ent. Soc., 1890, p. 562, pl. 20, fig. 3 . . . Sikhim.
(3). *ORYBINA REGALIS, Leech, Entom., xxii., 1889, p. 71, pl. iv., fig. 9 . . . . Japan.

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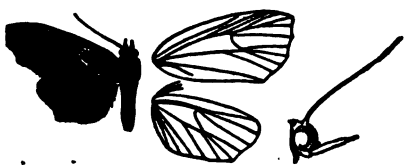
Genus Proteinia.

Proteinia, Hmpsn., Moths of India, vol. iv, p. 182 (1896).

♀. Palpi porrect, slender, projecting about two and a-half times length of head, the 3rd joint about half the length of 2nd; maxillary palpi minute; frons rounded; antennæ nearly simple; tibiæ smooth. Forewing with the outer margin slightly angled at veins



Proteinia pallifrons, ♀, ½ (from Moths Ind., vol. iv.).

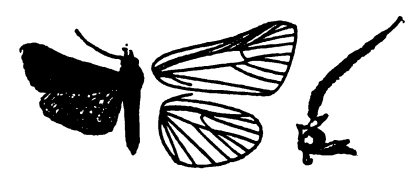
6 and 4, then excised to outer angle; veins 3, 4, 5 from angle of cell; 6 from upper angle; 7 from 8 after 9; 10, 11 free. Hindwing with the outer margin slightly angled at vein 4; veins 3, 4, 5 from angle of cell; 6, from upper angle.

Type. Proteinia pallifrons, Snell., Trans. Ent. Soc., 1890, p. 560 . . . . . Sikhim.

Genus Loryma.

Loryma, Wlk., xix., 890 (1859).
Beria, Wlk., Journ. Linn. Soc., vii., p. 61 (1863).
Tauba, Wlk., xxxv., 1766 (1866).
Ulotrichodes, Rag., Ann. Ent. Soc. Fr., 1891, p. 53.

Palpi porrect and straight; the 2nd joint thickly scaled, and with a long sharp tuft of hair from extremity below, extending as far as



Loryma recusata, ♂, ½ (from Moths Ind, vol. iv.).

the 3rd joint; maxillary palpi filiform; antennæ of male fasciculate with a sharp tuft of hair curved forward from basal joint, the shaft

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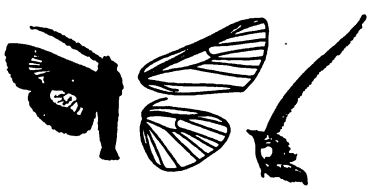
set on at an angle; tibiæ fringed with hair, the spurs long. Forewing long and narrow, with the costa nearly straight; the outer margin very obliquely curved; vein 3 from near angle of cell; 4, 5 approximated for one-third length; 6 from upper angle; 7 given off from 8 before 9. Hindwing with vein 3 from angle of cell; 4, 5 approximated for nearly half their length; the discocellular highly angled; veins 6, 7 from upper angle.

Type. (1). †Loryma sentiusalis, Wlk., xix., 891 . E.&W.Africa.
Ulotrichodes monotænialis, Rag., Ann. Soc. Ent. Fr., 1891, p. 58.
(2). †Loryma althalialis, Wlk., xvii., 258 . S. Africa.
Asopia cultralis, Snell., Tijd. v. Ent., 1872, p. 88, pl. 7, fig. 5.
(3). Loryma recusata, Wlk., Journ. Linn. Soc., vii., p. 62 . . . . . India, Ceylon, Borneo.
Tauba venosella, Wlk., xxxv., 1767.

Genus Tretopteryx.

Tretopteryx. Rag., Ann. Soc. Ent. Fr., 1891, p. 95.

Palpi porrect and downcurved, extending about the length of head and clothed with very long hair; proboscis well developed; maxillary palpi clothed with long hair; frons hairy; antennæ of male with fascicles of long cilia; tibiæ hairy; abdomen long.



Tretopteryx pertusalis, ♂, ½.

Forewing with the costa straight; the apex rounded; vein 3 from before angle of cell; 4, 5 well separated at origin; 6 shortly stalked with 7, 8, 9; 10, 11 free. Hindwing with vein 3 from before angle of cell; 4, 5 well separated at origin; 6, 7 from upper angle.

Type. Tretopteryx pertusalis, Hübn., Zutr., p. 763 . E. Europe, W. Asia.
Cledeobia weissenbornii, Frr., p. 478.
†*Cledeobia vitreosa*, Warr., A. M. N. H., 1891, p. 436.

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Genus Constantia.

Constantia, Rag., Bull. Soc. Ent. Fr., 1887, p. cxxxvii.
Dattinia, Rag., Bull. Soc. Ent. Fr., 1887, p. cxxxvii.
Zonora, Swinh., P. Z. S., 1889, p. 419.
Mnesixena, Meyr., Trans. Ent. Soc., 1890, p. 472.
Palura, Rag., Ann. Ent. Soc. Fr., 1891, p. 61.
Palmitia, Rag., Ann. Ent. Soc. Fr., 1891, p. 78.
Hercynodes, Rag., Ann. Ent. Soc. Fr., 1895, p. xxii.

Proboscis absent; palpi porrect and downcurved, about the length of head and thickly scaled, the 3rd joint minute; maxillary palpi thickly scaled; antennæ with the basal joint thickly tufted with scales in front; mid and hind tibiæ of male with the outer spurs short. Forewing with the costa nearly straight; the inner

Constantia opiparalis, ♂, ½ (from Moths Ind., vol. iv.).

and outer margins forming a nearly even curve; vein 3 from before angle of cell; 5 from above angle; 6 from upper angle; 10, 11 free. Hindwing with the discocellulars highly angled; vein 3 from before angle of cell; 5 from slightly above angle; 6, 7 from upper angle.

Sect. I. (*Dattinia*).—Antennæ of male ciliated, forewing with vein 7 from 8 after 9.

(1).	Constantia proximalis, Christ., Hor. Ent. Ross., xvii., p. 116; and Rom. Mem., iii., pl. 1, fig. 7.	
	†Hypotia ingrata, Butl., P. Z. S., 1881, p. 621	Armenia, Persia, C. Asia, Sind.
	†*Hypotia rubella*, Swinh., P. Z. S., 1884, p. 523, pl. 48, fig. 9.	
(2).	Constantia concatenalis, Led., Wien Ent. Mon., 1858, p. 145, pl. 3, fig. 3	E. Europe, Syria.
(3).	Constantia staudingerialis, Rag., Ann. Ent. Soc. Fr., 1891	Algeria.

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(4). CONSTANTIA SYRTALIS, Rag., Bull. Soc. Ent. Fr., 1887, p. 137; and 1890, pl. 8, fig. 4. Tunis, Egypt.
Mnesixena bella, Beth.-Baker, Trans. Ent. Soc., 1894, pl. 1, fig. 14.

Sect. II. Antennæ of male bipectinate, with short branches to two-thirds length.

A. (*Constantia*). Forewing with vein 7 given off after 9, or from the same point as it.

Type. (5). CONSTANTIA COLCHICALIS, H. S., vi., p. 148; Pyr., fig. 136 . . . . . E. Europe, W. Asia.

(6). †CONSTANTIA OPIPARALIS, Swinh, P. Z. S., 1889, p. 419, pl. 44, fig. 11 . . . Sind.

B. (*Palura*). Forewing with vein 7 given off from 8 before 9.

a. Forewing with vein 4 widely separated from 5 at origin.

(7). CONSTANTIA SPECIOSALIS, Christ., Rom. Mem., ii., p. 141, pl. vii., fig. 11 . . C. Asia.

(8). CONSTANTIA MASSILIALIS, Dup., viii., 230, 5, p. 304 . . . . . C. Europe, Armenia.

(9). †CONSTANTIA BOLINALIS, Wlk., xvii., 266 (♀) S. Africa.
†*Scopula semirosealis*, Wlk, xxxiv., 1467.
Hypotia achatina, Feld., Reis. Nov., pl. 134, fig. 29.

(10). †CONSTANTIA VULGARIS, Butl., P. Z. S., 1881, p. 621 . . . . . Aden, Persia, Sind.

b. Forewing with vein 4 stalked with 5 in male, approximated to it in female.

(11). †CONSTANTIA EREMIALIS, Swinh., P. Z. S., 1889, p. 422 . . . . . Aden, Sind.

Sect. III. Antennæ of male bipectinate, with long branches to apex.

(12). CONSTANTIA LEUCOGRAPHALIS, Rag., ? ined. Spain.

Auctorum.

Constantia pectinalis, H. S., fig. 50 . . . Corsica, Sicily.
Dattinia infulvalis, Led., Wien Ent. Mon., 1858, p. 146, pl. 3, fig. 6 . . . . . Syria.

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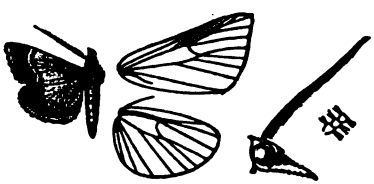
Dattinia subochralis, Rag., Ann. Ent. Soc. Fr., 1891, p. 60 . . . . . Algeria.
Hercynodes miegi, Rag., Ann. Ent. Soc. Fr., 1895, p. xxiii. . . . . Spain.
Hypotia cribellalis, Erschoff, Lep. Turk., p. 73, pl. 5, fig. 10 . . . . . Turkestan.
Hypotia bilinea, Bethune-Baker, Trans. Ent. Soc., 1894, p. 46, pl. 1, fig. 15 . . . . . Egypt.
Hypotia guttosalis, Christ., Deutsche Ent. Zeit. Lep., vi. p. 96 . . . . . C. Asia.

Genus Actenia.

Actenia, Guen., Delt. and Pyr., p. 134 (1854).
Libora, Rag., Ann. Ent. Soc. Fr., 1891, p. 89.
Elicia, Rag., Ann. Ent. Soc. Fr., 1891, p. 644.

Proboscis minute; palpi porrect and downcurved, extending about twice the length of head, the 2nd joint clothed with hair; maxillary palpi long and triangularly scaled; frons with a sharp tuft; antennæ of male with two pairs of bristles on each joint;



Actenia honestalis, ♂, ♮.

tibiæ nearly smoothly scaled. Forewing with the costa nearly straight; vein 8 from before angle; 4, 5 from angle; 6 from upper angle; 7 from 8 before 9; 10, 11 free. Hindwing with vein 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Type. (1). Actenia honestalis, Tr.; Schmett. Eur., vii., p. 49, x., 3, 7 . . . . . C. & E. Europe, Armenia.
(2). Actenia brunnealis, Tr. Schmett. Eur., vii., p. 48 . . . . . S. Europe.
Pyralis comparalis, Hübn., Pyr., fig. 126.
(3). Actenia malgassalis, Saal., Senck. Nat. Ges., 1880, p. 298 . . . . . Madagascar.
(4). Actenia gadesalis, Rag., Ann. Ent. Soc. Fr., 1882, p. lxv. . . . . Spain.

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Auctorum.

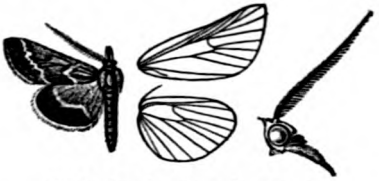
Actenia borgialis, Dup., Lep. Fr., viii., p. 302, pl. 230, fig. 4 . . . . . S. Europe.

Actenia byzacænicalis, Rag., Bull. Soc. Ent. Fr., 1887, p. 138; and 1891, pl. 16, fig. 7 . . Tunis.

Genus Cledeobia.

Cledeobia, Steph., Cat. Brit. Ins., ii., p. 159 (1829).
Synaphe, Hübn., Verz.; p. 347 (1827) non descr.

Proboscis small; palpi porrect and downcurved, extending about three times length of head, and thickly clothed with hair; maxillary palpi long and triangularly scaled; frons with a tuft of hair;



Cledeobia bombycalis, ♂, ½.

tibiæ nearly smoothly scaled. Forewing long and narrow, the costa nearly straight; vein 3 from before angle of cell; 4, 5 well-separated at origin; 6 from upper angle; 7 from 8 before 9. Hindwing with vein 3 from before angle of cell; 4, 5 well separated at origin; 6, 7 from upper angle.

Sect. I. Antennæ of male bipectinated.

(1). Cledeobia bombycalis, Schiff., Wien Verz., p. 120 . . . . . S. Europe, Armenia.
Bombyx austriaca, Esp. iii., pl. 86, fig. 2.
Cledeobia provincialis, Dup., Lep. Fr., viii., p. 74, pl. 214, fig. 3.
Cledeobia castillalis, Guen., Delt. and Pyr., p. 143.

(2). Cledeobia moldavica, Esp., iii., pl. 86, fig. 1 . . . . . S. Europe.
Pyralis netricalis, Hübn., Pyr., fig. 158.
Cledeobia græcalis, Dup., Lep. Fr., viii., p. 76, pl. 214, fig. 1.
Cledeobia palermitalis, Guen., Delt. and Pyr., p. 141, pl. 7, fig. 3.

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Cledeobia aberralis, Guen., Delt. and Pyr., p. 141.
Cledeobia diffidalis, Guen., Delt. and Pyr., p. 142.

(3). CLEDEOBIA CONSESSORALIS, Ersch., Lep. Turk., p. 72, pl. 5, figs. 77, 78 . . . Turkestan.

(4). CLEDEOBIA CONSECRATALIS, Led., Verh. Z. B. Wien, 1855, p. 250, pl. 3 . . Armenia.

(5). CLEDEOBIA UXORIALIS, Led., Wien Ent. Mon., 1858, p. 146, pl. 3 . . . Syria.

(6). CLEDEOBIA ISTHMICALIS, Led., Wien Ent. Mon., 1858, pl. 3, fig. 9 . . . . Syria.

(7). CLEDEOBIA TURANICALIS, Rag., Ann. Ent. Soc. Fr., 1891, p. 93 . . . . Persia.

Sect. II. Antennæ of male, with two pairs of bristles from each joint.

(8). CLEDEOBIA ARMENIALIS, Led., Ann. Soc. Ent. Belge., 1870, p. 51, pl. 11, figs. 7, 8 Armenia.

(9). CLEDEOBIA CONNECTALIS, Hübn., Pyr., fig. 91 . . . . . S. Europe.
Pyralis luridalis, F. R., p. 267, pl. 90, fig. 3.
Cledeobia lorquinalis, Guen., Delt. and Pyr., p. 138.
Cledeobia subolivalis, Oberth., Bull. Soc. Ent. Fr., 6 (vii.), p. 76.

Type. (10). CLEDEOBIA ANGUSTALIS, Schiff., Wien Verz., p. 120 . . . . . Europe.
Phalæna erigalis, Fabr., Ent. Syst., No. 408.
Phalæna curtalis, Fabr., Ent. Syst., No. 409.
Crambus erigatus, Fabr., Suppl., 469.

(11). CLEDEOBIA MORBIDALIS, Guen., Luc. Exp. Alg., p. 398, pl. 4, fig. 5 . . . Algeria, Mauritius.

(12). CLEDEOBIA BERYTALIS, Rag., Ann. Ent. Soc. Fr., 1888, p. 276, pl. 6, fig. 1 . . Syria.

Auctorum.

Cledeobia interjunctalis, Guen., Luc. Exp. Alg., p. 398 . . . . . Algeria.

Cledeobia oculatalis, Rag., Bull. Soc. Ent. Fr., 1885, p. 201 ; and 1888, pl. 6, figs. 7 and 8 . Spain, Algeria.

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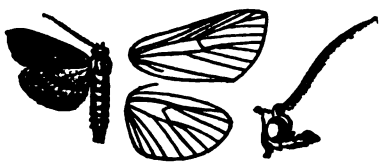
Cledeobia draconalis, Rag., Ann. Ent. Soc. Fr., 1891, p. 94. . . . . Borneo.
Cledeobia bleusei, Oberth., Et. Ent., xii., p. 34, pl. vi., fig. 38 . . . . . Algeria.

Genus Tyndis.

Tyndis, Rag., Ann. Ent. Soc. Fr., 1891, p. 83.
Actenioides, Warr., A. M. N. H. (6), ix., p. 173 (1893).

Palpi porrect, straight and reaching well beyond the frons, the 2nd joint clothed with hair, the 3rd small; maxillary palpi minute and filiform; antennæ of male with fascicles of cilia, the basal joint dilated, curved, and roughly scaled; tibiæ moderately scaled.



Tyndis hypotialis, ♂, ½ (from Moths Ind., vol. iv.).

Forewing narrow; the costa nearly straight; the outer margin oblique; vein 3 from angle of cell; 4, 5 approximated for one-third length; 6 from upper angle; 7 from 8 before 9; 10, 11 free. Hindwing with vein 3 from angle of cell; 4, 5 approximated for one-third length; 6, 7 from upper angle.

Type. (1). °Tyndys tanganialis, Rag., Ann. Ent. Soc. Fr., 1891, p. 85 . . . . . E. Africa.
(2). †Tyndis hypotialis, Swinh., P. Z. S., 1885, p. 866 . . . . . India, Ceylon.
†*Nephopteryx creperalis*, Swinh., P. Z. S., 1885, p. 877, pl. 57, fig. 20.
(3). Tyndis plana, Wlk., Trans. Ent. Soc. (3), i., p. 93 . . . . . W. India.
†*Hypotia zumia*, Swinh., P. Z. S., 1884, p. 518, pl. 47, fig. 12.
†*Hypotia allalis*, Swinh., P. Z. S., 1886; p. 462, pl. 41, fig. 2.

Genus Discordia.

Discordia, Swinh., P. Z. S., 1885, p. 448.

Palpi porrect, projecting about the length of head and fringed with hair below at extremity; maxillary palpi filiform; antennæ

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of male nearly simple; mid and hind tibiæ with the outer terminal spurs short. Forewing narrow; the costa straight; the inner and outer margins evenly curved; vein 3 from before angle of cell;

Discordia basalis, ♂, ½ (from Moths Ind., vol. iv.).

4, 5 from angle; 6 from upper angle; 7 from 8 before 9; 10, 11 free. Hindwing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Type.
(1). †DISCORDIA EVULSA, Swinh., P. Z. S., 1885, p. 448, pl. 27, fig. 2 . . . . . Bombay.
(2). †DISCORDIA BASALIS, Hmpsn., Moths of India, vol. iv., p. 187 . . . . . Ceylon.
(3). †DISCORDIA SINIFERALIS, Hmpsn., Moths of India, vol. iv., p. 187 . . . . . Ceylon.

Genera auctorum.

Essina atribasasilis, Rag., Ann. Ent. Soc. Fr., 1890, p. 28 . . . . . E. Africa.
Arispe concretalis, Rag., Ann. Ent. Soc. Fr., 1890, p. 54, pl. 8, fig. 2 . . . . . Mexico.
Arispe ovalis, Rag., Ann. Ent. Soc. Fr., 1890, p. 55, pl. 8, fig. 3 . . . . . Mexico.
Aglossodes prionophoralis, Rag., Ann. Ent. Soc. Fr., 1890, p. 63, pl. 8, fig. 5 . . . Natal.
Baniura syrticolalis, Rag., Ann. Ent. Soc. Fr., 1887, p. 137; and 1890, pl. 8, fig. 6 . . . Tunis.
Arsenaria dattini, Rag., Bull. Soc. Ent. Fr., 1887, p. 138 . . . . . Tunis.
Ctenarthria khorgosalis, Rag., Ann. Ent. Soc. Fr., 1890, p. 66; and 1891, pl. 16, fig. 11 . . . C. Asia.
Precopia atomalis, Christ., Stett. Ent., 1887, p. 166; and Rom. Mem., v., pl. iii, fig. 6 . . C. Asia.
Exarcha ineptalis, Led., Wien Ent. Mon., 1863, p. 50, pl. 7, fig. 8 . . . . . Venezuela.
Episonora speciosalis, Christ., Rom. Mem., ii., p. 141, pl. vii, fig. 11; and Rag., Ann. Ent. Soc. Fr. 1891, p. 637 . . . . . C. Asia.

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Species omitted.

Pyralis trilatalis, Wlk., xxxiv., 1237, belongs to the *Acontiinæ*.

Stemmatophora nicalis, Grote, Bull. U. S. Geol. Surv., iv., p. 671 = *Bobys uxorculalis*, Hulst., Tr. Ann. Ent. Soc., xiii., p. 153, belongs to the *Pyraustinæ*.

Pyralis palesalis, Wlk., xvii., 269, type lost.

Labanda herbealis, Wlk., xvii., 284, belongs to the *Noctuidæ*.

Pyralis janiusalis, Wlk., xix., 904, type lost.

Labanda saturalis, Wlk., xxxiv., 1251, belongs to the *Noctuidæ*.

Pyralis ægnusalis, Wlk., xix., 905, belongs to the *Phycitinæ*.

Pyralis ratoalis, Wlk., xix., 916, belongs to the *Phycitinæ*.

Pyralis noctualis, Wlk., xxxiv., 1231, is a Noctua = *Celæna diffundens*, Wlk.

Pyralis plumbealis, Wlk., xxxiv., 1232, type lost.

Pyralis humeralis, Wlk., xxxiv., 1233, type lost.

Pyralis turbidalis, Wlk., xxxiv., 1245, belongs to the *Deltoidinæ*.

Pyralis subcordalis, Wlk., xxxiv., 1248, belongs to the *Noctuidæ*.

Aglossa chloromelalis, Wlk., xxxiv., 1249, belongs to the *Tineidæ*.

Sacoria congrualis, Wlk., xxxiv., 1256, type lost.

Cledeobia albipalpis, Pag., Verz. Lep. Amb., p. 7, belongs to the *Deltoidinæ*.

Pyralis obstructalis, Wlk., xxxiv., 1240, is a *Noctuid* = *Hypenodes costastrigalis*, Steph.

Eretmopteryx flabelligera, Saalm., Lep. Madag., i., pl. vi., fig. 80, is a *Lithosid*.

Pyralis admetalis, Wlk., xix., 908, type lost.

Pyralis byzesalis, Wlk., xix., 894, type lost.

Pyralis (?) *contractalis*, Wlk., xxxiv, 1230, belongs to the *Acidaliinæ*.

Pyralis subjectalis, Wlk., xxxiv., 1233, type lost.

Locastra sagarisalis, Wlk., xvi., 160, type lost.

Stemmatophora albopunctalis, Druce, Biol. Centr. Am. Het., ii., p. 201, pl. 60, fig. 1, is a *Noctua*.

Diplopseustis haplodes, Meyr., Trans. Ent. Soc., 1887, p. 197, is a *Pyraustid*, gen. *Cybolomia*.

Diplopseustis hemiophthalma, Meyr., Trans. Ent. Soc. 1894, p. 286, is a *Pyraustid*, gen. *Sufetula*.

Pyralis procrisalis, Wlk., xvii., 272, belongs to the *Phycitinæ*.

Endotricha cydippealis, Wlk., xvii., 391, type lost.

Pyralis atialis, Wlk., xix., 896 = *varipes*, xxxiv., 1225, and *vexatilis*, xxxiv., 1192, is a *Tortricomorpha Tineidæ*.

Labanda ceylusalis, Wlk., xix., 919, belongs to the *Noctuidæ*.

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XIV. *Notes on Seasonal Dimorphism in South African* Rhopalocera. By Guy A. K. Marshall, F.E.S.

[Read May 6th, 1896.]

I am much pleased to observe that the very important and long-neglected subject of Seasonal Dimorphism in African Butterflies is at last receiving the attention of so eminent an authority on entomological matters as Mr. A. G. Butler, and I trust that the short paper before me will soon be supplemented by many of a like nature, for it is high time that the nomenclature of African *Rhopalocera*, and more especially the *Pieridæ*, should be thoroughly revised from the standpoint of seasonal variation. The opinions expressed by my friend, Mr. Cecil W. Barker, in his most interesting paper on this subject (Trans. Ent. Soc. 1895, p. 413) will, I think, be upheld by all South African lepidopterists who have taken the trouble to investigate the matter, though I consider his rule that the dry season form is generally smaller than the wet season one to be inadvisable, for the exceptions to it certainly equal if they do not exceed the illustrations of it. Mr. Butler's remarks on the group of *Teracoli*, represented by *T. vesta*, Reiche, are in every way excellent, but when he proceeds to discuss the seasonal forms of the genus *Acræa* we have an instructive example of the extreme difficulty in accurately defining the specific differences of butterflies merely from a series of museum specimens when not backed up by a practical knowledge of the habits and range of the species involved. Indeed, I have not the slightest hesitation in stating that, in the present instance, the results arrived at are entirely incorrect and misleading. Here is Mr. Butler's provisional revision of the *Acrita* group :—

Dry season form.		Wet season form.
(1.) *Acræa anacreon*, Trim.	=	*Acræa bomba*, H. G. Smith.
(2.) *Acræa guillemei*, Oberth.	=	*Acræa periphanes*, Oberth.
(3.) *Acræa doubledayi*, Guer.	=	*Acræa dircaea*, Westw.
(4.) *Acræa stenobea*, Wallg.	=	*Acræa caldarena*, Hew.
(5.) *Acræa pudorina*, Staud.	=	*Acræa cæribula*, Oberth.

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It will be advisable to discuss each of these pairs separately in order to properly test the truth or otherwise of the contention that they are merely seasonal forms of one species.

(1.) *A. anacreon*, Trim. = *A. bomba*, H. G. Smith. *Bomba* is quite unknown to me, and at the present time I am unable to obtain access to the description of the type, but I note that Mr. Butler considers it to be identical with *induna*, Trim., described from specimens captured by myself in Mashunaland. Assuming this provisionally to be the case, I think I can clearly show that *bomba* (= *induna*) is very far from being a seasonal form of *A. anacreon*, Trim. I have taken *induna* fairly commonly in Salisbury (5,000 ft.) during every month in the year, except the three driest and coldest, viz., May, June, and July; it is, however, most abundant during the height of the rains, from the middle of December to the middle of March. In the Gadzima district on the middle Umfuli River (4,200 ft.) it is not very common. On the sources of the Mazoë River (4,000 ft.), about 20 miles north of Salisbury, it was distinctly scarce, and its eastern range seems to extend only to Umtali (3,700 ft.). Throughout the whole of this area where I have been collecting carefully for the last three years, I have never seen or heard of a single specimen of *anacreon*. Moreover it is noteworthy that *induna* itself exhibits seasonal variation. The ♂ and ♀ figured by Trimen (Trans. Ent. Soc. 1895, pl. v., figs. 3, 3a) are wet season forms, though not very strongly marked ones. [N.B. The figure of the ♂ does not properly show the markedly paler tint of the ground-colour of the forewings beyond middle, as compared with the basal portion.]

In the extreme dry season form the ♂ and ♀ are almost identically coloured, the black basal suffusion in the hindwings being much reduced or even obsolete. The black marginal edging of hindwings is also reduced, so that the three yellow spots in it which are nearest the anal angle merge into the ground-colour, and the remainder up to the apical angle are clearly defined.

In the wet season form the ♂ has a strong black basal suffusion in the hindwings, and the hindmargin is better developed, the contained yellow spots being much reduced, and those near apical angles almost always obsolete. The ♀ also exhibits these differences, but the

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blackish suffusion in hindwings is usually more developed, and in some specimens almost entirely obliterates the red ground-colour. The forewings are much paler, being in some cases creamy with ochreous basal suffusion.

Anacreon I have met with in Natal, where it occurs commonly all the year round. This species also exhibits a distinct dry season form (variety A of Trimen) in which the wings are more elongate with the black markings attenuated. Apart from the fact that *anacreon* itself occurs abundantly during the wet season, if *induna* is really the wet season form of this very common species, how is it that it has never been met with in Natal, and *anacreon* has never been met with in Mashunaland?

To summarise: We have here two species strikingly different in appearance, and of different habits, one of which is only found within the tropic, while the other only occurs to the south of it, and both of which exhibit seasonal forms independently, yet we are asked to believe that these are merely seasonal forms of one and the same species. If such be the results of the theory that the apical patch in *Acræa* is a seasonal and not a specific difference, the sooner that theory is demolished the better.

(2.) *A. guillimei*, Oberth. = *A. periphanes*, Oberth. I am quite unacquainted with either of these species, and therefore cannot comment upon their association.

(3.) *A. doubledayi*, Guer. = *A. dircæa*, Westw.
A. stenobea, Wallg. = *A. caldarena*, Hew.

This proposed alteration of nomenclature shows a most lamentable confusion as to what are real specific differences in *Acræa*. I entirely agree with Trimen that *A. dircæa*, Westw., is quite inseparable from *A. caldarena*, Hew., being merely a seasonal variation of it, as is also *A. amphimalla*, Westw. As in the case of *anacreon*, a study of the geographical range of the forms under consideration would in itself be sufficient to show the fallacy of Mr. Butler's supposition. *Caldarena* is one of the commonest butterflies in Mashunaland, and occurs abundantly the whole year round, showing a slight seasonal dimorphism. The ♂ varies but little, showing only a slight accentuation of the black markings in summer, the ground-colour being of a richer pink; but in the ♀ this accentuation is often carried to a much

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greater extent, the fuscous suffusion in the hindwings almost entirely veiling the ground-colour. The colour of the forewings also shows a strong tendency, as in *A. induna*, to become of a pale creamy tint. Such specimens often exhibit more or less white clouding in the hindwings. *Caldarena* is essentially a tropical species, only just entering the extra-tropical area, whereas *stenobea* is not found in the tropics at all, but occurs as far south as the Eastern districts of the Cape Colony. The only point at which its range overlaps that of *caldarena* appears to be in the region of the Marico and Upper Limpopo Rivers.

I have never met with this insect in life, but from the description I have not the slightest doubt that *A. lygus*, Druce (= *stenobea*, var. A of Trimen) is merely the dry season form of *stenobea*. The absurdity of amalgamating *stenobea* with *caldarena* is therefore manifest. With regard to *doubledayi* there is no question that it is quite distinct from *caldarena* (= *dircæa*), for apart from the fact that they both occur at all seasons, their geographical ranges do not coincide at all—at least so far as my experience goes. *Doubledayi* does not occur in Mashunaland proper, being there represented by *A. axina*, Westw., and throughout South-East Africa it seems to be confined more or less to the coast belt. While travelling from Salisbury to Beira I observed that after leaving Umtali *caldarena* became gradually scarcer, and after crossing the Revnë River it disappeared altogether. *A. doubledayi* I first met with in the Manini Valley (somewhat west of the Revnë River), and it was plentiful from there right down to the coast.

(5.) *A. pudorina*, Staud. *A. chæribula*, Oberth. I am unacquainted with either of these species; but I notice that Mr. Butler considers *A. acrita*, Dew., to be merely an intermediate form between the two. The latter butterfly I have only met with on a few occasions in Mashunaland throughout the dry season. Had Mr. Butler's theory been correct, I ought to have taken not *acrita*, but *pudorina*. Again, Mr. F. C. Selous, collecting in Manica from January to June, through the height of the rains, took a long series of *acrita*; how is it he never came across the so-called wet season form *chæribula*? These specimens have been referred to by Trimen (P. Z. S., Jan. 16, 1894) and he has pointed out that they

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clearly exhibit seasonal variation along the normal lines. This has been quietly ignored by Mr. Butler, who has thereby fallen into the very error against which he warns us later on, viz.: that of confusing local with seasonal variation.

As the dimorphic forms in this genus seem to have been so misunderstood, perhaps a few remarks on other South African species may not be misplaced:—

Acræa asema, Hew. The bright coloured, strongly spotted summer form is replaced in winter by a duller form, in which the black markings are reduced, the two upper spots in subapical row usually being obsolete, and very nearly the whole now is absent.

Acræa aglaonica, Westw. Trimen, in discussing Selous' specimens of this species (P. Z. S., Jan. 16, 1894) refers to some of them as constituting rather a striking variety in the direction of *A. natalica*, Boisd. These are undoubtedly examples of the summer form, which differ from the typical winter form in having, as usual, all the black markings on the upper side very strongly developed. But the most noticeable difference is the disappearance of the peculiar transparent subapical patch, a form of seasonal variation without parallel in South Africa.

Several species, such as *A. petræa*, Boisd., *A. rahira*, Boisd., and *A. doubledayi*, Guer., vary very markedly in the ground-colouring of the ♀; but I need only cite the most noticeable example, viz.:—

Acræa halali, n. sp. This species was first taken by Mr. F. C. Selous on the Manini and Vanduzi Rivers, between Umtali and Chimiro, and I have since taken it very abundantly about Salisbury. Trimen considers it to be merely a slight variety of the southern *A. nohara*, Boisd.; but if *A. asema*, Hew., be considered distinct from *A. violarum*, Boisd. (which it is, in my opinion), there is even still more reason for separating *halali* from *nohara*. The description of the insect is as follows:—

♂ *Wet season* form. Bright brick-red, with a strong pink tinge in hindwings, especially towards base. Spots and markings of the same general pattern as in *A. nohara*, Boisd., but very much reduced, so as to give the insect a markedly different appearance; moreover, it differs constantly in the complete absence of the discal spot below first median nervule in forewing, and the third and fifth

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spots of discal row in hindwing (I have taken one very strongly marked ♂, in which the latter was present). The sub-basal spot below median nervure in forewings is very much reduced and often obsolete.

The underside is as in *nohara*, but the ground-colour in hindwing is of a rich pink outwardly tinged with ochreous; basal half of cell and a broad, irregular, transverse, discal band whitish, and third, fifth, and ninth spots of discal row wanting.

Dry season form. Larger ground-colour dull ochreous, black markings as in summer form, but spots decidedly larger. Underside much paler and duller. White markings almost obsolete.

♀ *Wet season form.* Ground-colour dull, pale grey, with faint ochreous inter-nervular rays in forewing. Markings as in wet season form of male, except that the black hindmarginal borders in both wings are broader, and suffused on their inner edges. On the underside the forewing is much paler, shining, inter-nervular rays more distinct. Hindwing pale-yellowish creamy, basal half variegated with patches of pink; markings as in ♂.

Dry season form. Larger, ground-colour as in dry season form of ♂, but with basal half of hindwing suffused with pinkish. Spots strongly developed, larger than in preceding form; inner edge of margin in hindwings clearly defined and not suffused. Underside as in dry season forms of ♂.

This species exhibits a greater amount of seasonal variation than any South African *Acræa* I know; but the change in the ♂ cannot be properly appreciated in dried specimens owing to the way in which the brilliant colours of the summer form fade. The specimens described are the extreme forms, and every grade between them can be found. The variation is most curious, as the black spots are much larger in the winter form instead of in the summer one, which shows how impossible it is to lay down any hard and fast rule in such matters. Owing to this development of the spots, the winter form presents a greater general resemblance to *A. nohara*, but the two cannot possibly be confused.

Several of the most striking and curious instances of seasonal dimorphism were passed over in Mr. Barker's paper. I will therefore now shortly refer to them.

When collecting specimens of the handsome genus

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Precis, I was not long in noticing that many of the species appeared only in winter, while others were confined exclusively to the summer. A closer investigation of these insects has convinced me that each of the summer species is identical with one of the winter species. My grouping of them is as follows:—

Wet season form.		Dry season form.
(1.) *Precis ceryne*, Boisd.	=	*Precis tukuoa*, Wallg.
(2.) *Precis simia*, Wallg.	=	*Precis cuama*, Hew.
(3.) *Precis octaira*, Cram.	=	*Precis sesamus*, Trim. *Precis amestris*, Drury.

Dry season form.		Wet season form.
(4.) *Precis archesia*, Cram.	=	*Precis pelasgis*, God. *Precis chapunga*, Hew.
(5.) *Precis artaxia*, Hew.	=	*Precis nachtigalii*, Dew.

In *P. natalica*, Feld., *P. tugela*, Trim., and *P. elgiva*, Hew., the seasonal forms are not nearly so marked, and they have, therefore, not been separated. As regards *P. sophia*, Fab., which can hardly be considered as a true South African species, the West Coast variety mentioned by Trimen (S. Af. But., vol. i., p. 221) will doubtless prove to be its dry season form.

The alterations exhibited in this genus are of special interest, not only on account of the great differences in the colouring of their two forms, but also because of their marked change in habits, and a study of them might give us a clearer insight into the true cause of dimorphism.

The general lines on which the variation runs in the genus is as follows:—

The dry season form is smaller, and usually assumes a duller type of colouring on the upper side, sometimes of quite a different hue; the underside becomes of a general brownish tint, more or less resembling a withered leaf, the likeness being heightened by an oblique line running from the apex of forewing to the anal angle of hindwing representing the midrib; also by the marked prolongation of the forewing, so well known in the winter form of *Melanitis leda*. Lastly, the ocelli on the underside are much reduced or obsolescent.

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For convenience the species may be divided into two groups: (1) Those in which the seasonal forms do not vary on upperside and very little on underside. (2) Those in which a marked variation occurs. An interesting fact about these groups is that the first, comprising *P. natalica*, *P. tugela*, and *P. elgiva*, is confined to the warmer, low-lying, or heavily-timbered districts (especially along the East Coast), whereas the remaining more variable species occur more abundantly, or even exclusively, in the uplands and in open country. Moreover, in the former, bush-loving group, the underside of the wet season form exhibits almost as great a resemblance to a leaf as does that of the dry season one. The following notes on some of the species may be of interest:—

Precis tugela, Trim. The underside of the summer form changes from its somewhat variegated colouring to an almost uniform dark brown or grey brown; the mid-rib stripe being very clearly defined, and the apex of the forewing still more strongly produced. The only difference on the upper side is the presence, in the winter form, of an ochre-yellow line along costa of forewing. The summer form was first taken by Messrs. J. M. Hutchinson and C. W. Barker, at Karkloof, Natal, in the end of February, 1894; but by the middle of March it had almost been superseded by the winter form. Mr. Hutchinson informs me that there is a marked difference in the habits of the two forms. The smaller summer form is a bolder insect, sailing around and settling on trees at a fair height, almost after the manner of *Charaxes*, whereas the other is much more retiring, keeping among the thick bush and settling low down, or on the ground among dead leaves, etc. This fact will be of interest when we come to discuss the species in which the seasonal forms are not so universally acknowledged.

Precis elgiva, Hew. This species changes but little. The upperside remains unaltered. The winter form is darker and duller than the summer one below, the markings being more indistinct, and the ocelli reduced to mere dots. The apex of forewing is slightly more falcate, as usual.

Precis natalica, Feld. Varies on the same lines as the preceding species, the white markings on the underside of the wet season form becoming much reduced or even obsolete.

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We now come to the second group in which the seasonal forms are very distinct, and not generally recognised as such. I will deal with them in the order given in my list above.

(1.) *P. ceryne*, Boisd. =*P. tukuoa*, Wallg. I have never met with these species commonly in life, and am, therefore, unable, to speak from personal experience, but Mr. Hutchinson, of Estcourt, and Mr. Barker, of Malvern, who have both collected for many years in such different parts of Natal, assure me that they are convinced that *tukuoa* is only the dry season form of *ceryne*. Trimen, too, notes the close relationship of the species; indeed, in former years he held them to be the same. They exhibit just the differences one would expect in this genus, the bright tints of *ceryne* being replaced in *tukuoa* by duller colours, the latter also having the ocelli reduced and the forewings strongly falcated.

(2.) *P. simia*, Wallg. = *P. cuama*, Hew. These two so-called species are not common just round Salisbury; but in the upper Mazoe River and middle Umfuli River they are abundant; and I have had excellent opportunities of observing the gradual change from dry to wet season forms, though, unfortunately not *vice versa*. This is a very interesting case of variation owing to the distinct gradations exhibited between the two forms, which may be grouped as follows, according to season:—

(*a*) Midsummer Form.—The typical, small, heavily-marked *P. simia*, Wallg.

(*b*) Early Summer Form.—The larger, more lightly marked form of *simia*, with tendency to white clouding on upperside, described by Trimen as a variety (P. Z. S., 16 Jan., 1894).

(*c*) Late Winter Form.—*P. cuama*, Hew., in which the underside is very much darker and more overclouded than in *simia*, though the markings are precisely similar and well defined, showing a preliminary sign of the midrib line. Apices of forewings falcate.

(*d*) Midwinter Form.—*Cuama*, in which the underside shows most strongly the leaf-like appearance, the *simia* markings being almost obliterated by brown, grey, or yellowish clouding, with midrib line distinct, forewings very strongly falcate.

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The type appears to be intermediate between the last two forms, as of course every grade can be found between the two extremes. The dry season form only frequents the bush, settling on the ground among the dead leaves, or very rarely on small plants, the underside colouring affording it excellent protection. As the season advances the habits of the insect change, and in October and November the later form (*c*) may be found in company with the early form of *simia* (*b*), frequenting open tops of kopjes, flying boldly about within a limited area, and settling with expanded wings on shrubs and bushes. This is the habit of all summer forms of *Precis*, and in the end of December in both the Mazoe and Umfuli districts I have seen some numbers of *P. octaira*, *P. simia*, *P. pelasgis*, and *P. nachtigalii*, chasing one another around in open spots on hill-tops, and at the same time there were a few battered specimens of *P. sesamus*, *P. cuama*, *P. archesia*, and *P. artaxia*, all of which were evidently on the verge of disappearing.

(3.) *P. octaira*, Cram. = *P. sesamus*, Trim. (= *P. amestris*, Drury). The dissimilarity in seasonal forms is most marked in this species, but there is much evidence to show their identity. Apart from the fact that they are confined respectively to the wet and dry season, they have been taken in copulâ by Mr. F. N. Streatfield in the Transkri Territory, and on several occasions by Mr. Barker, at Malvern. Moreover, intermediate forms are by no means uncommon, many being recorded by Trimen. On the strength of such seasonal forms alone Mr. Oberthur, in 1883, decided that *P. octaira*, Cram., and *P. amestris*, Drury, were one and the same species. This latter insect is evidently the northern winter form of *octaira*. The larvæ and pupæ of *octaira* and *sesamus* seem to be indistinguishable. In February, 1888, Mr. Hutchinson found a dozen *Precis* larvæ feeding together on one bush, and at the time he considered them to be those of a single species. Early in March they emerged, there being two *octaira* and ten *sesamus*. The latter differs from the normal type of winter *Precis* in the absence of leaf-like colouring below, and the very slight falcation of forewings. This is accounted for by its different habits, for instead of frequenting dead leaves in the bush it prefers the dark rocks on stony and wooded kopjes. The development of the falcation in forewings is

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evidently correlated with the leaf-like coloration on the underside in this genus.

(4.) *P. archesia*, Cram. = *P. pelasgis*, God. (= *P. chapunga*, Hew.). The intimate connection between these three forms is much more evident. The conspicuous pale stripe of the summer *Pelasgis* is much darkened and reduced in *archesia* on both surfaces, the underside assuming the usual leaf-like markings, and the apices of forewings being strongly falcate. Trimen's var. A of *archesia* is evidently an intermediate form. I have met with only one example of *chapunga*, which I captured on the 29th December, 1894, in the Maroë Valley in company with *pelasgis*, and I am convinced that it is nothing but an intermediate form of that insect in the direction of *archesia*. In the latter the discal band of the hindwings often shows a tendency to break up into rings round the ocelli, as in typical *chapunga*. Mr. Barker informs me that he has on one occasion taken *archesia* and *pelasgis* in copulâ at Malvern.

(5.) *P. artaxia*, Hew. = *P. nachtigalii*, Dew. These forms are practically identical on the upperside, but the undersides are very different. *Artaxia* with its more falcate forewings and distinctly leaf-like underside, occurs (in Mashunaland at least) only during the drier part of the year, being replaced in December by the smaller *P. nachtigalii*, which is darker and clearer below, with the two ocelli of upperside clearly reproduced in the hindwing. In December, 1895, on two occasions I took a battered ♂ of *artaxia* in copulâ with a newly emerged ♀ of *nachtigalii*. An objection to the amalgamation of these two forms was suggested to me in the fact that Mr. Selous, collecting between Umtali and the coast during the wet season, never took *nachtigalii* but only *artaxia*. I have shown specimens of the former to Mr. Selous, but he asserted that he had never seen the insect. However, while going from Salisbury to Beira, during January, 1896, I kept a careful look out for *nachtigalii*. The most easterly specimens I captured were two ♂s, in very bad condition, on the top of Christmas Pass, near Umtali, on the 14th of January. Beyond that I only observed *artaxia*, taking a fine newly emerged specimen at Chimiro on the 16th January. If my remarks on the *Tugela* group be borne in mind, it will be seen that these facts do not at all invalidate my

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contention, but bear out Mr. Butler's remark, that "it does not follow, because a species does not vary in one part of Africa, that it therefore shows equal constancy in another part." In the warmer timbered coast belt *artaxia* varies very little seasonally, but on the plateau the variation is very marked. Mr. A. B. Koe, of Estcourt, informs me that when on a shooting trip in Angoniland (alt. circ. 4,000 ft.), near Lake Nyassa, he took *P. nachtigalii* in considerable numbers in the end of December, 1892, and they were then just emerging.

Another genus presenting most interesting local seasonal variation is *Mycalesis*, the winter forms in the highlands of the interior being markedly different from those of the coast region. In the Mazoe and Umfuli districts of Mashunaland I captured *Mycalesis simonsii*, Butl., and *M. selousi*, Trim., very commonly during the dry season, but they invariably disappeared as the rains set in; in fact, the former is only to be found among the long withered grass with which its colouring harmonizes so well. As I have always considered it to be an axiom that in South Africa there is no such thing as a species (in the true sense of the word) which is confined exclusively to the dry season, I therefore proceeded to investigate the case of *simonsii* and *selousi*, and I am now convinced that they are respectively the dry season forms of *M. perspicua*, Trim., and *M. safitza*, Hew.

Trimen has noted the close connection between *simonsii* and *perspicua*, and, indeed, the underside of the southern winter form of the latter is practically indistinguishable from that of *simonsii*. Moreover, towards the change of seasons *simonsii* shows a strong tendency towards the upperside coloration of *perspicua*, some specimens becoming dark grey in the costal and apical area of forewings, with a paler grey tint partially obscuring the remaining yellow of upperside.

(6.) Such specimens also show a marked development of the ocelli both above and below. I have seen specimens of *perspicua* taken on the Shire River by Mr. Koe, in June, 1892, and they are similar to the Natal form. During the winter of 1893, when travelling from the Limpopo to Salisbury, along the main Mashuna plateau, I never saw a trace of *simonsii*, though when Mr. Koe went up to Matabeleland next winter he observed it first as he

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reached the higher veldt as far south as Mangwe where it was common.

The case of *M. safitza*, Hew., is yet more curious. It is a common species on the Natal coast where it exhibits a distinct dry season form described by Hopffer under the name *evenus*. At Kuysua, in the Cape Colony, *evenus* is found both in summer and winter; along the East Coast *safitza* occurs in summer, *evenus* in the winter; on the plateaux in Mashunaland we have *safitza* in summer and *selousi* in winter.

The nomenclature of the South African *Mycalesis* should therefore stand thus:—

Wet season form.	Dry season form.
Mycalesis safitza, Hew. =	*Mycalesis evenus*, Hopf. *Mycalesis selousi*, Trim.
Mycalesis perspicua, Trim. =	*Mycalesis simonsii*, Butl.

There are several other species of the *Nymphalidæ* which I believe will eventually be admitted to be merely seasonal forms, but I have not sufficient data to deal with them at present. Neither have I sufficient scope in the limits of the present paper to attempt to offer any explanation of the reason of the greater or less seasonal changes in various species, that being a subject of considerable complexity, to which I hope to return later.

In conclusion, I can only trust that the foregoing remarks may show the field lepidopterists in South Africa, whose numbers, I am glad to say, are increasing annually, the immense importance of labelling every specimen in their collections with locality and date of capture. And further, I hope they may be induced to put on record more than they have done in past years, their experience of the habits, range, etc., of the various species with which they are familiar, for the benefit of systematists at home who are doing such excellent work, but who are often liable to fall into error in differentiating species merely from lack of support on the part of collectors.

Since writing the above I am glad to be able to record an instance of seasonal dimorphism in the genus *Terias* which has been proved by breeding experiments.

While staying with Mr. J. M. Hutchinson, of Estcourt, Natal, in the latter half of last February, I succeeded in obtaining a number of eggs of *Terias zoë*. On my leaving

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for England Mr. Hutchinson kindly undertook to rear the larvæ for me and communicate the result. I have just heard from him that two specimens emerged on the 31st of March, and they are undoubtedly *Terias brigitta*, which Mr. Barker has already pointed out as being the probable dry season form of *T. zoë*. Mr. Hutchinson states that the two specimens are lighter on the underside than typical *T. brigitta*, and this is what I should have expected as they are representatives of the early dry season (winter) brood. Their offspring, which would emerge about midwinter, that is in June, will probably show the strongly marked reddish underside of true *brigitta*.

(1.) Since writing this I have had an opportunity of examining the British Museum series upon which Mr. Butler based his theory. There are five specimens labelled as "*Acræa bomba*, Smith (= *induna*, Trim.)," four of these are undoubtedly *A. anacreon*, Trim., and are without any broad apical black patch. The fifth specimen, which has a very heavy black patch and the disc of both wings strongly suffused with blackish, is probably *induna* though differing somewhat from my Mashunaland specimens, and has absolutely no connection with the four examples associated with it. These latter are somewhat lightly marked specimens of *anacreon* and probably represent the *dry* season form in Nyasaland—not the wet, as stated by Mr. Butler. Judging by the figure of Mr. Crose Smith's *bomba* it is not represented in the series at all.

(2.) There are only two specimens of *A. periphanes* in the British Museum, and I certainly doubt their being the wet season form of *guillemei*. The black edging of primaries is certainly slightly better developed in them, but the hind marginal border of secondaries is not nearly so heavily marked as in *guillemei*, and this does not in any way accord with my experience of seasonal changes in this genus.

(3.) The form alluded to here is the *Precis octaira*, var. *natalensis* of Staudinger. I agree with Mr. Butler in considering it to be specifically distinct from the typical *octaira*, Cram., from the West Coast, but I see no necessity for renaming it. This species should therefore stand as *Precis natalensis*, Staud. (= *P. octaira*, Trim. (part) = *Jun. calescens*, Butl.).

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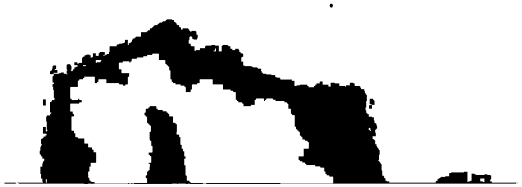
(4.) This form (*b*) has been named *Junonia trimenii* by Mr. Butler, therefore both this name and *J. micromera*, Butl. (which is absolutely identical with *P. simia*, Wallg.), will stand as synonyms of *Precis cuama*, Hewitson.

(5.) Since writing I have been able to re-examine this specimen which is in Mr. Trimen's collection. It is clearly an intermediate seasonal form of *pelasgis*; but I cannot agree with Mr. Trimen in attributing it to *P. chapunga*. This latter appears to be a Central African variety of *pelasgis*, and *P. archesia*, var. *staudingeri*, Dew., is probably its dry season form.

(6.) I have seen a specimen from Central Africa, in which the whole upperside colouring is exactly intermediate in tint between *simonsii* and *perspicua*.



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XV. *On the Phylogeny and Evolution of the* Lepidoptera *from a pupal and oval standpoint.* By Dr. Thomas Algernon Chapman, M.D., F.E.S.

[Read June 4th, 1896.]

The title of this paper is perhaps too ambitious, and would require a volume rather than a short paper to elucidate it. It is incorrect, in so far that I do not propose to do more than state, as clearly as I can, what I believe to be the special dominating condition that underlies the evolution of the lepidopterous pupa, from its earliest to its latest forms. It is obvious that if there be such a condition, and it can be at all successfully apprehended, it will give us much greater certainty in using the details of pupal structure as guides to the true phylogeny of the Lepidoptera, and will show us in what respects they are of value, and where they give less definite indications.

Though I cannot claim to present the subject in more than a tentative form, I am emboldened to do so by the encouragement given by our President in his last address to the use of the "scientific imagination," of which I hope this is a legitimate instance.

What I have to advance may be stigmatised as a mere speculative hypothesis. Perchance it may prove to be so and nothing more. My own belief is that it will be useful and valuable in guiding the study of pupal forms and understanding their significance, even if it should finally appear that it has a very secondary, instead of a primary, place in marking out the lines of lepidopterous evolution.

The precise lines by which the quiescent, inactive pupa, say of bees or beetles, was derived from the active larva-like pupa, if the term is indeed at all applicable, such as those of bugs or crickets, hardly concerns me here; but it is of interest to note that the great mass of *Coleoptera* and *Hymenoptera* have a pupa of very uniform type, helpless from its quiescence, and hence resorting for protection to some cocoon or other cavity. Probably as secondary to such protection, being of very delicate

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cutaneous structure and possessing no hard chitinous parts, the imaginal appendages are all present, quite distinct and separate from each other, but incapable of any movement.

The exceptions in these two orders in which the pupa is exposed, and consequently of harder external texture, are by no means few in actual number, but are isolated to single species, genera, and rarely families, and seem nowhere to have given occasion to any further evolutional development.

Actually numerous as these exceptions may be, in comparison with the totals of these large orders, it is hardly erroneous to neglect them, and say that the protected pupa of delicate texture is universal throughout these two orders, and that no further development by departure from this rule has taken place within them.

In all protected pupæ the problem has to be faced, how is the imago to free itself from the cocoon or other envelope protecting the pupa. In the *Hymenoptera* and *Coleoptera* this is effected by aid of the imaginal jaws. The imago becomes perfect within the cocoon; it not only throws off the pupal skin within the cocoon, but remains there till its appendages have become fully expanded and completely hardened, and then the mandibles are used to force an outlet of escape. Throughout these orders it is the rule that the imago requires its jaws for other purposes—purposes that we may regard as the primary reason for their existence. Still, their use to extricate the insect from its pupal residence can hardly be called a secondary matter, and in many cases, even in some whole families, they are of no use whatever to the imago except in this one particular; the *Cynipidæ* are perhaps the most striking instance of this circumstance.

Certain families of the *Neuroptera* struck out a new line in this matter. One or two families appear to have followed the same lines precisely as the *Coleoptera* and *Hymenoptera*. Whether the new departure was a development from these, or whether it was in some way a partial retention of the characteristics of the -tive pupa, I have no materials to decid- but the fac- hat in a group of families the pu- -wise q- and of delicate structure, retai- develo- dibles, and by aid of these the -icates -n the

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cocoon immediately previous to the emergence of the imago.

When we note that the most neuropterous of these families retain active and useful jaws as imagines, and that some of these, as the *Hemerobiidæ*, have jaws of a remarkably modified structure, we may at any rate conclude that in this group of families the mandibular structures were in a highly plastic condition for development in any direction that appeared advantageous.

This peculiar method of escape from the cocoon associates with these *Neuroptera*, the *Phryganeidæ*, and the *Micropterygidæ*, families whose affinities with the *Neuroptera* on the one hand, and the *Lepidoptera* on the other, have long been recognized, as well established on other grounds.

This relationship between the *Lepidoptera* and the *Neuroptera* was first clearly established by McLachlan at a time when it was rank heresy to make such a suggestion, and to whom sufficient credit for so definite a breaking of new ground has hardly yet been accorded.

I believe Dr. Sharp quite agrees with me in assimilating the *Phryganeidæ* and the *Micropterygidæ* together, as being, though somewhat far apart, still nearer together than either is to the Neuroptera on one hand, or to the Lepidoptera on the other. I believe he sets more value on their neuropterous than on their lepidopterous affinities, whilst I take rather the contrary view, regarding the lower *Adelidæ* as being very probably directly derived from the *Micropteryges*. No doubt the question is more a question of personal equation than of fact, and I would agree that Dr. Sharp, taking a broader standpoint than mine, is possibly able to secure a more correct view.

There are two points that I may claim as making them *Lepidoptera* rather than *Neuroptera*. The first is that *Neuroptera* are carnivorous, *Lepidoptera* phytophagous. The phytophagous habit is strong in the *Phryganeidæ*, absolute in the *Micropteryges*. The other, which more concerns the subject of the present paper, is that they have lost the imaginal jaws. *Micropteryx* has a distinctly lepidopterous haustellum. Looking to the more neuropterous families with pupal jaws, we find they have also imaginal jaws; it is therefore apparently correct to conclude that the loss of the imaginal jaw is secondary to the

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acquirement of active pupal jaws, and that the discovery thus made that an imago without jaws was a satisfactory organism, opened up the whole field for the evolution both of the *Lepidoptera* and *Diptera*. I may say that I see every reason to believe that the *Diptera* also originated here, along with the *Lepidoptera*, and that they had to face the same problems that beset the *Lepidoptera* as to the escape of the imago from its cocoon, without the use of imaginal jaws. Up to a certain point their solutions were very similar, but later the *Diptera* made one or two remarkable advances, of which we find no trace in the *Lepidoptera*.

The history of the evolution of the Lepidoptera, from a pupal point of view, is, then, from the very beginning, a history of the solution in various ways and degrees, of the problem of how to escape from the cocoon without the aid of imaginal jaws; if this was not the dominant feature in lepidopterous evolution, it was at least so important as to leave distinctive features on almost every family of *Lepidoptera*, up to the point at which the problem appears to have received the most satisfactory possible solution, or rather *a* most satisfactory possible solution. When this point was reached, and it appears to have been reached by several different roads, their pupal structure presents a great similarity amongst a large number of very distinct and unallied families—those, in fact, which are classed together as *Macro-heterocera*.

Taking, then, the *Micropteryges* as being the lowest Lepidoptera from our present as from most other points of view, we find a method of escape from the cocoon that differs in several important respects from that in which the perfect imago accomplishes this by the aid of its own jaws.

We may note, however, that though it is nominally the pupa that escapes from the cocoon, it is in reality still the imago, the imago clothed in the effete pupal skin. To rupture the cocoon, it uses not its own jaws, but those of the pupal skin, energising them, however, in some totally different way from ordinary direct muscular action, their movements being the result of the vermicular movements of the pupa, acting probably by fluid pressure on the articular structure of the jaws, by some arrangement not altogether different perhaps from the frontal [illegible] of the higher Diptera.

How this extraordinary [illegible]d of escape [illegible]ated

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and was developed from the earlier and simpler method, is a matter deserving of investigation, and will no doubt yield many interesting facts. That I say nothing about it is due to sheer ignorance, and not the ostensible reason that it is outside the *Lepidoptera*.

In the *Micropteryges* the jaws of the pupa not only rupture the cocoon, but appear to be the most active agents in dragging the pupa through the opening in the cocoon and through any superincumbent earth, being merely assisted by the vermicular action of the abdominal segments, and we find in accordance with this circumstance that the pupal envelope is still very thin and delicate, and has little or no hardening or roughness by which to obtain a leverage against the walls of the channel of escape.

There are no doubt many lost families at this point, and we do not find precisely the next stage in the progress of pupal evolution. In all other instances we not only find the pupal jaws absolutely lost, and also a general hardening of the pupal skin, with a development of roughness across the abdominal dorsum, but, perhaps, inevitable with the hardening pupal skin, we find also a considerable consolidation of previously separate and movable parts.

No doubt it was soon found that great assistance to the emergence from the cocoon was obtained by a hardened and rough abdominal integument, and this directly led to the further step that by a little weakening or valvular structure of the cocoon, the jaws might be absolutely dispensed with.

In *Limacodes* we find all the segments of the abdomen still free, and the appendages, though fused together, are fused so slightly as to be easily separated without injury, and the cocoon is provided with an easily separated lid.

In the lower Adelids the segments are more fused together, and by aid of a beak more or less developed, and the cocoon being made of a valved larval case, exit from the cocoon is achieved. It would seem that a beak was early adopted as a weapon for breaking open the cocoon, as it exists in nearly all the *Incompletæ*, except the *Limacodid* and *Nepticulid* section.

In all these instances the pupa emerges from the cocoon precisely as in the *Micropteryges*, that is, the moth

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it really is that emerges, but does so encased in the pupal skin. To achieve this object, it seems to have been found most efficient to have three, four, or five abdominal segments capable of movement, but to have the terminal sections soldered together. So few as two free segments is found only in the *Gracilariidæ*, and is, therefore, probably a number disadvantageously small.

A cremaster is very rare in this section, and its use, where it exists, appears to be to enable a cable of silk not to retain the pupa within the cocoon, but to restrain it at precisely that degree of emergence from the cocoon that is most desirable; this is usually attained when the movable segments have so far emerged from the cocoon that they are no longer capable of acting in the cocoon as locomotor organs. The pupa usually retains this position by the elasticity of the cocoon gripping it tightly, but in many Tortrices and others a cremaster and loose cable as just mentioned exists.

The next step, that intermediate between the *Incompletæ* and *Obtectæ*, I have so far only met with in the genus *Epermenia* (*Chauliodus*). It probably results in some instances from a cremaster preventing the escape of the pupa from the cocoon, and a slender cocoon permitting the escape of the moth.

We want many more facts at this point, if perchance they are attainable. The transition is a very notable one, we pass from what we might almost call the true lepidopterous (if it were not also equally dipterous) process of emergence, emergence within the pupal skin, to the direct emergence of the imago from the cocoon, leaving the pupal skin behind it, precisely the process in the bees and beetles, with the important difference that imaginal jaws are not required, and the less important one that some final expansion and hardening have still to be accomplished.

It puzzled me a great deal to understand why the *Obtectæ* always had the fifth and sixth abdominal segments free and no others, both sexes being the same. The exceptions being almost literally none, and *Epermenia* being, so far, the only transitional form I had met with.

Now throughout the *Obtectæ* there are many devices for breaking through the c[illegible]: specially constructed weak places in the cocoon, [illegible]oftening fluid, [illegible]d by the moth, assisted by [illegible]ppliances of [illegible]

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sorts, such as in *Hybocampa* and *Attacus*, and so forth, but all adhere to the special obtect formula of the fifth and sixth abdominal segments only being free.

I conclude that this structure of the pupa is that which affords far beyond any other, at once, a solid basis and an extensible ladder, by which the imago can attain a pupal fulcrum from which to reach and rupture the cocoon and force itself out.

The questions of animal mechanics involved are, however, I must admit, too complex and difficult for me to analyse them successfully.

A remarkable confirmation of this hypothesis is, however, presented by the butterflies.

It seems very probable that when the Skippers had but recently obtained obtect rank, they were not only still capable of further evolution in the direction of consolidation of pupal segments, but had, if it is legitimate so to express it, a distinct impulse towards further consolidation. They would, however, no doubt ordinarily have adhered to the usual obtect formula, but for one circumstance, viz., they succeeded in doing without any sort of cocoon.

The mechanical problem of how to escape from the cocoon by the way of least resistance, no longer dominated them; and accordingly we find in each group of butterflies, that certain families have lost the power of movement in one, two, or all three of the incisions that are movable in the *Obtectæ*. That the families with least movement in each division happen to be the highest, may be the result of what I have called the impulse to such progress, existing in the Skippers. Much more probably the loss of movement occurred in each instance for some special reason, probably in pursuance of protective devices that so dominate the evolution of butterfly pupæ, and as there was no going back, it results inevitably that in each line of development, the most solid pupa must be the most recent.

In my first paper presented to the Society in 1893, I believe I gave the impression that I believed that all the Lepidoptera might be arranged by their pupæ in one line; I had not this idea myself, but I had not formed any alternative view with sufficient definiteness to enable me to advance it.

I do not know that I can go much further yet, but I

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may state what I believe to be the law on this point in this way. The Lepidoptera certainly cannot be arranged in one line by their pupæ, but the Lepidoptera of one line can be arranged by their pupæ.

Two forms having different pupæ, are either—

1. Not related (that is not nearly enough for definition).
2. If related, then the pupæ will tell which is descended from the other or which is furthest from the common ancestor.

A pupa with more movable segments cannot be descended from one with fewer; broadly, one that is more consolidated or has lost certain parts, cannot be ancestral to one with more movable parts, or that retains appendages.

I have been forced to conclude that there have been several lines of evolution in the Lepidoptera all more or less parallel. That the *Obtectæ* in fact are not a homogeneous group and were not derived from the *Incompletæ* at one point only, and then diverged, but that the obtect pupal form was reached from several different stirps of *Incompletæ* independently under the pressure of the problem placed from the first before the Lepidoptera, viz., what is the line of least resistance by which the imago may escape from pupa case and cocoon without the aid of mandibles? I am not prepared to say how far back it was that these several stirps diverged. I still see many reasons for deriving them from different branches of the Palæolepidoptera; on the other hand, I see that it is necessary to admit that, if there can be parallel lines in the neolepidoptera, there may equally be lines in the neolepidoptera parallel to others in the Palæolepidoptera, just as we have parallel families in the marsupials and placentals, and even in the Reptilia.

My arch heresy in this respect is in claiming a relationship between *Cossus* and *Hepialus*. *Hepialus* (starting from *Micropteryx*) presents many characters similar to *Cossus*, and in some respects is even further removed from *Micropteryx* than *Cossus* is. If we grant a parallel progression to *Cossus* and *Hepialus*, some of my objections to the orthodox view would be diminished.

It is no doubt very difficult to admit that neolepidoptera with the subcostal vein of the hindwing simplified in precisely the same manner, should be equally derived from a Hepialid and Micropterygid source, but there are many forms missing that it is not safe to form any

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very precise theories. I am less puzzled by the question of frenum and jugum. The jugum is certainly a remains of a wing lobe well-developed in many Neuroptera, and appears to have no such function as is attributed to it of combining the wings in flight, whilst there are distinct traces of a commencing frenulum in some stronger hairs in *Eriocephalids*.

With regard to the *Macro-lepidoptera*, I have not been able to find any definite pupal characters on which they may be classified, still less distributed in accordance to their phylogeny. A closer examination of a larger series of species may throw more light on the matter, but this is very doubtful, since, for example, I find in the *Geometrides*, pupæ as thoroughly obtect as the highest Noctuæ, whilst in some groups there are pupæ with dorsal head plates, and in some instances these even carry the eye-covers, a very parallel condition to that in the Skippers. Dorsal head plates also occur in Lasiocampids, Thyatyrids, Notodontids and some others. Obviously these remains of earlier structure appear in the lower families of each division.

It occurred to me to recur to some old ideas I had about the eggs of Lepidoptera, in hope of finding some solution of this difficulty.

It seems very probable that the eggs of Lepidoptera should give characters useful for classification, not only for the simple reason that every structure and habit does so, but because it is not merely a structure, but the whole individual at one stage of its existence, and because the circumstances of its environment being different from those of the later stages, it cannot have responded in the same manner as they have, and may, therefore, afford us differences and resemblances when they do not do so, or have them overlaid by various characters of more modern acquirement and less fundamental significance. Especially being the most ancestral stage, it may probably have some earlier characteristics, in spite of having varied in many particulars like the other stages.

We all know that in many genera the eggs of the different species are easily recognisable, as in Vanessa, Pieris, Ennomos, Acronycta, Cerura, &c. It is less easy to find characters from eggs of families, yet most of us can recognise a *Noctua* or a *Geometra* egg, one of a butterfly or of a sphinge.

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Can we then find any characters of ova that will enable us to determine the probable relationships of the different families to each other. In studying the significance of any structure, one must be led entirely by what it teaches, in nowise straining the facts to meet preconceived ideas, and not until this is done must one compare the results with those otherwise attained, and then see whether the differences in results are to be reconciled by a fresh interpretation in the newer or older studies.

Approaching the question of egg form in this spirit, lepidopterous eggs are seen at once to present at least two very definite types of egg, which we may name the upright and the flat egg.

The *upright egg* has the *Micropylar axis* vertical to the surface on which the egg is laid, and the two axes at right angles to this are equal in length, and in fact not definite in position, the egg being circular on any horizontal section.

The *flat egg* has the *Micropylar axis* parallel to the surface on which the egg is laid, whilst the other horizontal axis and the vertical axis are usually of different lengths.

When we examine the distribution of these two forms of eggs in different families, we find that there is rarely if ever an exception to the rule, that one form only exists in each family, and even in each superfamily, and that, broadly, there appears a very strong presumption that, at least amongst the macros, there is never an abrupt transition from the one form to the other, and that whilst the flat egg is probably the earliest form, and may still retain a capacity for reaching the vertical form, any reversion in this respect is very doubtful.

If we confine ourselves to the true *Macro-lepidoptera*, we find the upright egg occurs in the butterflies and in the Noctuæ, whilst the flat egg is characteristic of the Geometræ and the Bombyces.

Now I think nineteen times out of twenty, perhaps ninety-nine out of a hundred, I should recognise a butterfly egg from any other, but I have so far failed to find any one definite character that can be predicated of all butterfly eggs and will at once distinguish them from all other upright eggs. Notwithstanding this, I think, we may properly divide the upright egg into two divisions—the butterflies and the Noctuæ.

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cation, we find a most valuable one in the chin glands of the larvæ. This curious structure is of so special a nature, that it would require very strong evidence to make one believe that it was separately acquired in different families, and so when we find that it occurs in butterflies, in Noctuæ, and in Notodonts, but nowhere amongst the families with flat eggs, the conclusions derived from the egg seem very strongly confirmed.

No one can doubt that the butterflies are widely separated from the Noctuæ, and the evidence of the Hesperid pupa shows that the butterfly separated from the Noctua stirps a very considerable way below any Noctua-like form, usually placed with the Macros. But this evidence of egg and larval chin gland suffices to show that they jointly separated from the Geometrid and Bombycids still lower down.

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If we take Mr. Meyrick's classification of Macros, based on unstated grounds, but obviously chiefly on venation, we find that he has collected together into his *Caradrinina* all the Macro-heterocera with upright eggs, with the single exception of the *Notodontidæ*.

It is interesting here, in passing, to note that though we may gird at the earlier classifications, we have to admit that, with no doubt some very important exceptions, they had a grip of the main outlines, at least, amongst the Macros.

The four chief groups that I make on egg characters are, as I have stated, largely the four old ones of Butterflies, Noctuæ, Geometræ, and Bombyces, and these are also practically the groups framed by Mr. Meyrick, though I think he has missed the real value of these groups in placing the Notodontas and sundry Bombyces in the Geometræ. He would also, though that is a small matter, have pleased me and many others had he kept the time-honoured names for the groups.

If we are to attach any value to the egg evidence, it is clear that the *Rhopalocera* are not derived, as Mr. Meyrick surmises, from any Pyralid form, since the Pyralids are of a higher type than the Hesperids, and still belong very markedly to the flat egg stirps, or one of them. The pupæ of the two groups are not derivable from a common form, without going very far back, much further back, than is implied in an immediate common ancestor.

A consideration of great weight, that I ought perhaps to have placed earlier, deserves attention, that is, the great fixity of the two types of egg, the upright and the flat, throughout the *Macro-heterocera*, which is still true, if we add the *Pyralidina*, as of nearly Macro rank. There is no clear indication, amongst all the upright forms, of derivation from a flat form or *vice versa*.

A few Geometrid forms are hardly even apparent exceptions to this, such, for instance, as *Ennomos*, where the packing together of the eggs has placed them in a sloping position, so that, so far as position goes, they can hardly be called flat; and, further, there is a certain amount of rim or crown round the micropylar end; but there is perhaps no clearer instance of the secondary axes being distinct amongst all the flat eggs than the eggs of *Ennomos* present to us.

Again, in the *Lasiocampidæ* we find the flat egg

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set up on end in much the same manner as in sundry Geometras.

In our common *Neustria* and *Lanestris* the eggs are set up on end, so that, regarding the mere terms of the definition, they are vertical eggs. They have, however, three distinct axes, and may be regarded as being laid not on the twig at the nadir from the micropyle, but really as being laid on one another, a further development of the condition presented in Endromis and some Saturnids, where the eggs are piled up on one another.

It must be noted, however, that in some families of Geometræ the eggs present a gradual development of the hexagonal pitting into a regular ribbing of the noctua or nymphalid type. These still retain the pitting over the nadir of the micropylar area, and in the *Acidalias* preserve three unequal axes, though in *Acidalia imitaria* they even present a tendency to be laid on the end. These are the nearest approach to an exception to the general rule that I have met with, and they suggest that the upright egg is the higher form, and that nymphalid ribbing is also a late development, and that the Geometrid egg is still capable of progress in these directions. It would be interesting to find a similar progress amongst Bombycid ova.

It is therefore obvious that the two forms of eggs, as we find them in the *Macro-heterocera*, must have been derived the one from the other, or both from some other form, at some much lower point in the phylogenetic series.

In trying to trace backwards the several forms of eggs, we find amongst the lower (Micro) forms a great preponderance of groups with flat eggs. This appears to be so, after making full allowance for the fact that our (or at least my) ignorance of the eggs of Micro-lepidoptera is considerable. The lowliest form with upright eggs is *Cossus*; this fact is curious, since both Zonzera and Tortrix, to which it is allied, have flat eggs. It is probable, therefore, that we here have the point where the two forms are still unfixed and capable of easy variation. The alliance (by pupa) of *Castnia* to *Cossus* would probably point to this being the origin of the butterfly st

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branch of the butterfly stem, cannot be so, as the eggs are flat.

Choreutidæ find their location somewhere low down, no doubt on the Noctuid division of the stem. This position explains at once the difficulty that systematists have felt to be unsolved, whether they place it on the Tineids or Tortricids. The egg is of a most beautiful and typical upright form.

The dorsal armature of the pupa of some genera is of a form I have met with nowhere else, being a close-set row of nearly spherical cups instead of the usual spines.

Nolidæ are possibly a branch from a point tolerably high up, but below the Notodontid division, advancing separately, so as to take rank, as judged by the pupa, at least as high as the summit of the Noctuid crown. The egg is extremely curious in one remarkable point; it is clearly an upright egg, ribbed, and broadly not unlike a Noctua egg, but is the only upright egg I have met with in which the horizontal section is not circular; this suggests an origin from the main stem low enough down to admit of such a variation taking place. The young larva, according to the opinion of Mr. Dyar, who kindly examined them, agrees very well with this position, whilst the loss of one pair of prolegs is a very ancient variation, no trace of the missing pair being discoverable even in the newly-hatched larva.

The pupa is also quite anomalous, regarded as a Macro; but would be explicable in the position I assign to it. It has only one movable segment, the fifth abdominal, and the terminal segments are very curiously abridged, so as to produce a flat end to the pupa, reminding one of Hepialus; the arrangement of the appendages is also inconsistent with a definite Macro position, the tarsi of the second and third pairs of legs projecting side by side beyond the wings and antennæ as a free process as far as the incision between the fifth and sixth segments. The detection by Mr. Hampson of maxillary palpi in a Nolid would not, in this view, be surprising; but would possibly suggest that *Nolids* are really a branch of the Tineid stirps that retains the maxillary palpi; the unequal axes of the egg would be a record of more recent and separate derivation from a flat egg form.

Chrysocorys, which almost certainly belongs to this

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stirps, in which flat eggs are the rule, has a remarkable egg, which is distinctly upright, and proves the transition from one form to the other not to be difficult at this point. It also shows that families with upright eggs may have more points of origin than the one apparently common to butterflies and Noctuæ.

The *Chloephoridæ* have also an upright egg; the vertical axis is extremely short, the general form being an exaggeration of the very depressed egg of the Acronyctas; but the ribbing is of a different type, it does not fall in line with the *Noctuæ*, still less with *Liparids* or *Arctiids*. The larva and pupa also suggest differences difficult to seize and impossible to put into description; that is to say, that they agree with, say Noctuæ, in any point I can put into words, and yet leave me with the impression that there is a fundamental difference. If this be a correct impression, there is no doubt some feature capable of observation and description that I have overlooked.

The *Noctuæ* have a spherical egg, ribbed vertically and with secondary transverse ribs. I do not know any egg that departs widely from this; *Acronyctas* are probably the extreme as to flatness. In some few the ribbing is obscure, apparently from being lost again. This egg is essentially the same as the *Piero-nymphalid* egg amongst the butterflies; that the higher development of the upright egg in each of its two great branches should be so similar is remarkable. We have already noted that the Geometrid egg tends in the same direction. The greatest difference is that the Noctua egg tends to have the micropylar axis shorter than the transverse (Acronycta, etc.), whilst the Piero-nymphalid egg tends to have it longer in nearly all groups.

The *Arctiid* egg is nearly spherical, smooth, and polished, with a netted surface very faintly marked.

The *Liparid* egg is not unlike the *Arctiid*, but with a denser texture, duller surface, and often with a depression at the summit. There is greater variation here than, say, in the *Noctua*. *Pudibunda* egg might almost be a Notodonta. *Monacha* is very like an *Arctia*. *Salicis* is enveloped in a curious foam-like gum, and one is not prepared to refuse a place to *Coryli*, *Ludifica*, and some others, although their eggs are distinctly Noctuan.

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The *Notodonta* egg is dense, dull-surfaced, opaque, and is a hemisphere laid on its flat side. *N. bucephala* has a spherical egg very like *Liparids*. *Cerura erminea* shows the capability of the Notodontid egg to become very depressed.

The Notodontids are a lower family than the other three typical ones, and it is interesting to find that as the *Noctuæ* are parallel in egg specialisation to the *Pieronymphalids*, so the Notodontids are parallel with the Hesperids, the forms being very similar.

Notodontids have been placed in more varied positions in classification (always, however, within the Macros) than almost any other family, and have especially been supposed to be on the way up to Sphinges, etc.

It seems to me impossible to intercalate a group like *Notodonta* between any two families with flat eggs, or even to make it a terminal branch (as in one sense all families are) from a flat-egged stirps. The chin-glands of the larva are a very strong item also. Mr. Dyar's researches on the larvæ do not seem to me to indicate with any certainty in which of the three great divisions of the Macro-heterocera it should be placed. He places it, however, with the Noctuæ. Mr. Meyrick places it with Geometræ, between the *Eupterotidæ* and the Sphinges (both Bombyces); apparently entirely on the evidence of the neuration.

Now it is unquestionable that the neuration of the *Noctuæ*, *Arctiids*, and *Liparids* is of a different character from the mass of the *Notodontids*, especially as regards vein 5; but this does not appear to disagree with the position to which I assign them, viz., in the Noctuid stem, some way below its final division into the three (with other exotic) highest families. In this lower position the venation is less specialised but more variable than in them; now the typical Notodontid venation is less specialised than in Noctua, but it varies more, in some instances into quite a Noctuid form, in others vein 5 is practically absent, and in some few forms there is even so definite a trace of a lowlier origin as indications of veins within the cell.

When we come to the pupæ, we meet with the same difficulty that affects all the *Macro-heterocera*, viz., that the differences between different families are often less than between different genera or even species within the same genus.

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A Geometra pupa is difficult to distinguish from a Noctua, especially a deltoid pupa, and so on.

Most species of Notodontids possess the dorsal head-plate (cephalo-thoracic piece) dwindled to a small, but quite definite portion. This does not at all settle its position, but shows that it is below the summit level of heteroceral, pupal evolution. The texture is distinctly noctuid, but this has reference to the subterranean position of the pupa. *Cerura*, with a different habit, might almost be Saturnian.

The cremastral development, consisting of two or four short spines, seem to be processes of the pupa rather than separate spines or bristles, as in most Noctuæ in some species they are quite obsolete (as in many Arctians), in others (Clostera) they are at the extremity of a long slender process. The chief feature in which they differ from Noctuæ is in the appendages falling short of the wings, but in this there is a great variety within the group. The way in which the abdominal segments do not materially taper till the 8th or 9th segment is distinctly Noctuan, but both this and the short appendage covers might be claimed as Lasiocampid.

The *Lithosiidæ*, *Euchromiidæ*, and *Syntomidæ* are hardly distinguishable from *Arctiidæ*. The *Agaristidæ* (*Alypia octomaculata* is the only species I have had from the egg) is very close to *Noctuidæ*. Of other (exotic) families and subfamilies (*Pericopidæ*, etc.) I am very ignorant.

The *Lithosiidæ* and some *Arctiidæ* (*Spilosoma*) are the only Macro-heterocera I know whose pupæ seem fairly on the way to lose all movement; in some instances, possibly, they have achieved that result. This is probably associated as cause and effect with their possessing a soft flimsy cocoon from which escape does not much depend on the nature of the support and fulcrum afforded by the pupal skin.

When we come to the Bombycoid stirps, there appear to be very good reasons for associating together a certain group of families, and these all are characterised by possessing a flat egg—that is, an egg so laid that the micropyle is not on top but at one end. This egg has three axes of different length, the micropylar being the longest, the vertical the shortest; it has generally a very smooth surface, the sculpturing being very slight and shallow,

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the texture often firm, but tending to be delicate, and it has, I think, always both ends of equal size—that is, it is not more narrowed towards the micropylar end or at all pear-shaped, and it tends less than the Geometrid egg to narrow towards the ends.

Packard's description of the egg of *Dryocampa rubicunda* may be taken as typical: "Oval, a little flattened, the shell yellow, thin parchment-like, the surface smooth, polished; under one-half inch objector showing no traces of pits or polygonal areas. The shell is so thin that unfertilized eggs collapse irregularly."

This group has three (at least) branches, the Lasiocampida and Eupterotida; and two branches of which, Endromidæ is possibly the base passing by *Aglia* to Citheronidæ and Sphingidæ on the one hand and to Bombycidæ and Saturnidæ on the other.

The form of egg is so similar to that obtaining in *Anthroceridæ* and *Megalopygidæ*, that I cannot resist the conclusion that this series originates in my "Micros whose larvæ are external feeders," though intermediate forms to bridge over the great distance between *Limacodes* and *Lasiocampa* are unknown to me. My observations on the spines of *Limacodes* and *Eacles*, and again of these and *Sphinges* and *Saturnids*, together with the much larger series on this subject published by Packard, and the observations of Poulton and Weissman, on larvæ of Aglia, Sphingidæ, etc., leave no room for doubt that all these families are related, to the exclusion of the Geometrid stirps. Most Macro pupæ, except, perhaps, the upper families of the Noctuid series, present some indications of a Micro derivation. Here the Lasiocampids (like the Notodontids) preserve traces of the dorsal head-piece; but a more important feature that is preserved is that of pupal locomotion. Some Lasiocampids can travel to and fro in their cocoons, whilst *Endromis* and *Sphinx* actually present instances of the pupæ emerging from their cocoons, this seems to be a feature distinctly binding this group together. They are all thick bodied.

The Geometrid section has a thicker egg than the Bombycid, usually with a bold raised netted sculpturing, the ends are often narrower making the egg distinctly ovoid, the micropylar end being the narrower. The moths are slender, the pupæ of not a few groups

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possess the dorsal head-piece; in some few Geometers the eye-pieces actually separate in connection with this piece, there are others in which the pieces separate without adhering to the head-piece. These forms are no doubt the lowest of the group; they occur in Eupithecia, Thera, and some allied genera.

In tracing these series downwards, we find the same form of egg in Crambus, in many Pyraloids, and in not a few *Tineina*, such as Chauliodus and Orneodes. In many of these we find, as in most Geometers, but never I think in Bombycids, that one end of the egg is narrower than the other, making the egg pear-shaped.

This stirps in fact includes nearly all the lower forms. The egg in different groups of these varies within wide limits. In some families it is very depressed and scale-like; as, indeed, is the Bombycid egg in many Limacodids, if we are correct in tracing the Bombycid egg to that origin.

If the Geometræ really belong to this stirps, we must note that the majority of the stirps culminating in the Pyralids preserve the maxillary palpus, and that the Geometrid Macros must be derived from branches lower down which have lost the palpus.

The *Cymatophoridæ* (*Thyatiridæ*) unquestionably, on the evidence of their ova, belong to the Geometrid division, many of them are still characteristically slight bodied. The larvæ of some genera preserve the Micro habit of living between leaves, though they have Macro legs. A trace of dorsal head-piece is always present in the pupa, which has the tapering hind segments of the Geometrid type. The Brephidæ almost certainly belong here and not to the Bombycids. The egg proves they are not Noctuæ.

The *Drepanulidæ* are very puzzling. I incline to place them here, they are probably like the *Nolidæ* on the Noctua stem, a form as high as any other, but with a separate origin low down. The egg is rather Bombycid than Geometrid, the larva is very isolated, the prolegs are of the same formula in the newly-hatched as in the adult larva, the pupa is of high Macro type. Whilst the imago is slender-bodied, preserves a frenulum, and has rather a Bombycid than Geometrid type of markings.

The complete circles of hooks on the larval prolegs in

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stage 1, with traces of the outer series of crochets in the adult larva, prove that it cannot be closely associated with any other Macro-heterocera, and whether we associate it with the Bombyces or Geometræ, it must have departed from the main stem very low down, probably so low that it would hardly be correct to recognise the stem so low down by its Macro name.

Mr. Dyar associates the Drepanulids with the Geometræ, the fashion of the young larvæ fastening leaves together flatly (like Cymatophorids) is the only character that is difficult to recognise, as, perchance, Bombycine.

On submitting an outline of this classification, by ova, to Mr. Dyar, it appears from the short criticism with which he favours me, that it substantially agrees with his larval classification, except on one point—that is, the position of the *Lasiocampidæ*, which he derives from the *Notodontidæ*. This, I find it extremely difficult to agree with. I find a great many points in the Notodontid pupa, in which it agrees with the Lasiocamps, so many as to prevent my saying there may not be some way of reconciling the differences. But I certainly do not see any, and think the agreements are instances of parallel variation or evolution, the two families being at very nearly the same level on their respective stems.

Mr. Dyar derives Lasiocampids from Notodonts. The Notodonts are higher in having less mobile pupæ and in having a vertical egg. Since the flat egg is probably the earlier form, it is improbable to a degree, for which impossible might not be too strong a term, that it should revert from the upright form in Notodonts to a flat one in Lasiocamps.

The *Notodontas* are, therefore, claimed both by Mr. Meyrick and Mr. Dyar as presenting an instance of a *per saltum* transition from a flat to a vertical egg, or *vice versa*, but with very different results as to the positions in which they place it. Whilst admitting that the conclusions I derive from egg structure will probably have to be largely modified by the acquisition of wider knowledge and a closer comparison with other structures, I do not think they will be so far overturned as to justify the position assigned to the Notodontids, beside *Lasiocampa* by Mr. Dyar, or beside Geometræ by Mr. Meyrick, their results being as mutually incompatible as they are with mine. Mr. Meyrick placing Notodonta amongst

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Geometræ and *Sphinges*, and deriving it (with them, and at some distance) from *Lasiocampa*.

Mr. Dyar really agrees with me as to *Notodonta*, placing it in *Noctuina* (Mr. Meyrick's *Caradinina*), but differs as to *Lasiocampa*, which he places above *Notodonta*. On each point, therefore, I have the agreement of one of these authorities, as against the other. I also agree with them as to the many points of resemblance between *Notodonta* and *Lasiocampa*, but differ in regarding them as the result of parallel and not of derivative variation.

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XVI. Termites *in captivity in England*. By George D. Haviland, M.A., and David Sharp, M.A., F.R.S., etc.

[Read October 21st, 1896.]

It will be recollected that at the meeting of the Society on June 5th, 1895, I exhibited on behalf of Mr. G. D. Haviland, who had brought them to England from Singapore, two societies of Termites in glass tubes. These small associations survived for a considerable period—very different in the case of the two species, however; and as there are some points of interest in connection with them, Mr. Haviland has kindly put together notes of his observations. The association of *Calotermes domesticus* was, however, in my charge during most of the time it existed. [D. S.]

Calotermes artocarporum [n. sp.].

* "The specimens were found by a native collector in Sarawak in the dead stump of a Champadak or Jack-fruit tree (*Artocarpus integrifolia*). He brought back a log of wood full of them about the middle of September, 1894. Some individuals were mounted and sent to Dr. Sharp.

"September 23rd the log of wood was split open and a search made for the queen; neither the queen nor any winged forms were discovered, but a king was found. Many of the individuals, including two or three soldiers, were put in a pudding dish with plenty of wood, and the dish was covered with glass. At first they were kept damp with moist cotton wool, but a peculiar fly became plentiful under the glass, so the damping of the cotton wool was given up. They were also at first protected from ants by placing their dish in water, but this protection was found unnecessary and was given up. They united the pieces of wood together by earthen walls derived from proctodeal discharges, thus protecting themselves from dry air and light. Generally, however,

* The parts in inverted commas are furnished by Mr. Haviland.—D.S.

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they passed solid oval frass like the furniture Termite (*Calotermes domesticus*). If picked up they discharged a drop of muddy fluid from the anus, which under the microscope was found to be literally crammed with infusoria.

"About December 16th some of these Termites were taken and placed in glass tubes plugged at the mouth with cotton wool and kept in a closed box in the dark. In some of the tubes 12 individuals and in others 24 were put. In a few days it was noticed that in two or three of the tubes there were Termites without the posterior end of their abdomen, they looked as if the posterior half had been snipped off. They were alive and on the wood. There was no evidence to support the idea that they had been bitten. It is probable, however, that the condition was in some way the consequence of insufficient food and moisture; for the wood that they were on was too hard for them.

"Many of the specimens preserved in spirit at this time, or earlier, have compound eyes, are yellowish in colour, and clearly are incipient neoteinic forms, unfortunately the exact dates at which the specimens were put into spirit are not recorded on the tubes.

"On January 2nd the following record of the tubes was made:—

"*Tube* 1. 19 individuals, without trace of wings, but varying in size; one is brown with brown compound eyes; another is yellowish white, uniform in colour except for the dark streak of the cardiac vessel, it is of smaller size than the first, and its compound eyes are not pigmented; the other 17 have no compound eyes, and are white except where the brown colour of the intestines shows through the cuticle.

"*Tube* 2. 16 are alive and two are dead at the bottom of the tube. They all seem to be in a bad way, and to be starving, the wood appears to be too hard for them. None of them have signs of compound eyes.

"*Tube* 3. 18 individuals, none are yellowish or have compound eyes. Their wood seems hard, but they are healthy.

"*Tube* 4. 11 individuals, healthy, none appear to have compound eyes.

"*Tube* 5. 7 individuals healthy, none appear to have compound eyes.

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"*Tube* 6. 7 individuals, some small and dwarf looking, none appear to have compound eyes.

"On February 21st the following observations were made at sea off Aden :—

"*Tube* 1. 4 individuals; one of them is brown with compound eyes; the other three are white and one of them is very short.

"*Tube* 2. 3 individuals, small and of starved appearance.

"*Tube* 3? 4 individuals, one large and one very short.

"*Tube* 4. 11 healthy individuals, one a well developed brown form with compound eyes.

"*Tube* 5? 2 miserable individuals.

"*Tube* 6. All dead.

"March 13th in the English Channel. The Termites seemed to stand the cold till the thermometer went down to 55 degrees, but yesterday the thermometer went lower and they were nearly dead, lying on their backs, just able to move a leg when breathed on. I have taken them down to the engine room where the majority at once recovered.

"March 30th. Almost all these Termites now have eyes and some of them are growing wings. In the dish are 56 still alive, all the soldiers are dead and there are no substitution forms; added 5 from a tube, making in all 61. In one of the tubes there is a substitution form.

"April 6th. Put all the Termites from the tubes into the dish, there is amongst them a good neoteinic individual.

"On December 5th, 1895, all the Termites except the neoteinic individual, which was a king, were dead. On December 7th he died also."

Calotermes domesticus [n. sp.].

"From the beginning of November to the 9th of December, 1894, a good number of individuals were kept in a tube under observation, but as no neoteinic individual could be seen spirit was added and some fresh tubes started. The exact dates of the starting of these tubes was not recorded, but none were started after January, 1895.

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"On March, 17th, 1895, they reached England and were sometimes exposed for brief intervals to cold, once to below 45 degrees F., when they were quite helpless, but soon recovered; generally they were kept warm artificially.

"On March 30th there was only one tube of them left, but that had a good number of individuals in it. It had frequently produced winged individuals and continued to do so at intervals, till there were but few left; these imagos could not escape through the plug of cotton wool, and did not seem to live many days after they had got their wings. So far there was no neoteinic individual recognized.

"On December 5th, 1895, Dr. Sharp, who then had charge of them, wrote: 'The colony is producing winged forms and eggs: where the eggs came from I have not ascertained, they are of comparatively large size; the Termites lift them in their mouths and carry them about as ants do.'"

The specimens of this species under my charge were all contained in a test tube 6 inches long, §-inch in diameter. The tube contained a large splinter of the wood the *Calotermes* eats, and was closed by a plug of cotton wool; the Termites never attempted to interfere with this plug, but kept away from it; occasionally it was taken out and a minute quantity of water was added to make the atmosphere damp. The intra-tubal arrangements of the Termites were interfered with in no other way; the tube was placed in a small card-box, packed with cotton wool to keep it steady, so that the Termites were not exposed to light; during the winter the box was placed in a corner of one of the apartments of the new museums at Cambridge (the Bird-room), under the hot-water pipes, but, notwithstanding this, it was exposed to great vicissitudes of temperature. The Termites, on the whole, did well, and had there been more of them to start with, it is, I think, probable that the association might have been maintained for a long time, instead of becoming extinct in October, 1896, after nearly two years of this highly artificial kind of existence. At first the colony produced numerous winged individuals, and this process continued for about a year; none of the winged individuals were taken out of the tube, and I think they all soon died. As a result, at the beginning of the

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present year the number of individuals in the tube was reduced to about twenty; for some time eggs in very small number were to be seen, I doubt whether more than four or five were produced; and they did not hatch. The number of individuals of the association continued to diminish throughout the summer, and as the autumn set in they languished more and more so that on the 17th October only a single individual was to be seen, and this was evidently dying. On that date I opened the tube and took out the fragment of wood, and splitting it up I discovered, concealed in a cavity, another individual, a neoteinic one, that doubtless had produced the eggs. As this cavity had been the centre of activity during the egg-laying period of the colony, I was not surprised at finding this queen in it. Although left quite alone, this specimen seemed in good health (though one of her feet had been amputated at some time). I removed her and placed her in the small glass tube in which I exhibit her this evening. The night of the 19–20th was cold, and on the morning of the 20th the queen was torpid, but revived on the tube being placed in a pocket of my waistcoat. The chief point of importance is that though this colony had abundant opportunities of using adult individuals for the purposes of reproduction they did not do so, but established a neoteinic queen. I have no reason to suppose that there was a male present, and this may have been the reason that none of the eggs hatched.

Very little trouble has been taken with this colony; indeed, it has often not been looked at for several weeks, and, as the result of this experiment, I feel sure that observations on living Termites may be carried on in this country with very little trouble. If an artificial termitarium such as that recently designed for ants by Mr. Ch. Janet, and described in the Ann. Soc. Ent. France, 1893, p. 467, were used, and care taken that the temperature never fell below 60 or 65 degrees Fahr., I believe very little difficulty would be experienced in keeping the creatures in good health and in making valuable observations. *Calotermes domesticus* seems specially suitable for the purpose; it is a very abundant and destructive insect at Singapore, but there is not the slightest danger of its doing any damage in this country. Indeed, I may remark, that all the evidence goes to show that Termites

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can nowhere be destructive until after they have been established for some considerable time in any given locality. Their increase can be carried on at a good rate only after a certain complexness of conditions has been established. Finally, I may remark that I am inclined to believe that the posterior parts of the bodies of individuals of this species may have been eaten by their associates, but I never saw the act.

18TH DECEMBER, 1896.

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THE

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1896.

February 5th, 1896.

Professor RAPHAEL MELDOLA, F.R.S., President, in the Chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Nomination of Vice-Presidents.

The President announced that he had already nominated Dr. D. Sharp, F.R.S., Mr. Roland Trimen, F.R.S., and Mr. Walter F. H. Blandford, Vice-Presidents for the Session 1896—1897.

Election of Fellows.

The Rev. John Hocking, M.A., of Copdock Rectory, Ipswich, and Mr. J. C. Moberley, M.A., of 9, Radstock Place, Southampton, were elected Fellows of the Society.

Correspondence.

Mr. Goss, one of the Secretaries, read the following letter from Mr. S. H. Scudder:—

CAMBRIDGE, MASS., U.S.A., *December 15th*, 1895.

DEAR SIR,

I have to-day received your announcement of my election as an Honorary Fellow of the Entomological Society

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of London, and hasten to assure you of my grateful recognition of the honour.

In view of the limited membership and of the distinguished ability of those upon whom this honour has been conferred from the beginning, I can but regard it as the highest compliment that can be paid an entomologist and a complete recognition of his services to science.

If the Librarian will kindly send me a list of my publications in the Society's possession *not* in the printed Catalogue of 1893, I will make the series as complete as it is in my power to do.

With cordial greetings to the Society,

I remain,

Very sincerely yours,

SAML. H. SCUDDER.

H. Goss, Esq.,

Hon. Sec. Entomological Society of London.

Exhibitions, etc.

Mr. Waterhouse exhibited pupæ and portions of pupæ of a silk moth, *Antheræa mylitta*, selected from some scores of specimens, which he had opened to see if they showed stages of development agreeing with the examples given by Dr. Spuler. Mr. Waterhouse's remarks were illustrated by a diagram. The results appeared to confirm Dr. Spuler's researches; some specimens showed the tracheæ, the median vein having two branches, very rarely emitting a third branch in the direction of the radial. Other specimens had faint indications of the veins and of the discoidal spot of the imago. Even at this very early stage the vein branching from the subcostal vein to unite with the upper radial, and the short branch uniting the second median vein with the third median were distinctly traceable, no tracheæ being yet visible in these branches. Mr. Waterhouse said that these specimens showed (1) that the branch vein connecting the subcostal with the radial veins, and the short piece connecting the second median with the third median veins were developed quite independently of the tracheæ seen in the early

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stages of the pupa; (2) that the subcostal trachea at quite a late stage emitted a branch to join the radial vein, where it either united with or took the place of the radial tracheæ; (3) that the median trachea at a late stage emitted a branch to join the third median vein, which it entered and apparently took the place of the first branch of the radial trachea. Mr. Merrifield, Mr. Hampson, and Dr. Sharp took part in the discussion which ensued.

Mr. E. E. Green remarked that in the Trans. Ent. Soc., 1881, page 601, there was a short paper by the late Prof. J. O. Westwood, describing a curious little insect from Ceylon under the name of *Dyscritina longisetosa*. Prof. Westwood believed his typical specimens to be immature. Mr. Green exhibited what he supposed to be a later stage of the same species. He said his example differed in some particulars from Westwood's description and figure—notably in the proportions of the caudal appendages. Prof. Westwood pointed out the affinities of *Dyscritina* to the Forficulidæ. This was very apparent in the specimen under consideration. Putting aside the nature of the caudal appendages the insect was in all particulars an earwig. The present specimen was taken in the Punduloya district of Ceylon, at an elevation of about 4,000 feet. Mr. Green said he had more than once seen this insect under loose pieces of bark and in crevices of rocks, and had always been struck by its likeness to an earwig both in appearance and habits. Mr. McLachlan, Dr. Sharp, Mr. Gahan, Mr. Blandford, and Mr. Hampson made some remarks on the subject.

Mr. O. E. Janson exhibited a Goliath beetle, from the Upper Congo, which he believed to be the male of *Goliathus russus*, Kolbe, described from a unique female example in the Berlin Museum.

Mr. Blandford called attention to a case of the eye of a boy affected with inflammation caused by the hairs of the larvæ of *Lasiocampa rubi*. The attack recurred after an interval of nineteen weeks, and in several continental cases this recurrence of the attack had been found to take place, and in some cases permanent injury to the eye had followed.

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Mr. Blandford discussed the various kinds of hairs on several caterpillars, certain species having hairs of two kinds, one kind being barbed, and thus having the power to work into the skin. This was the case with *Cnethocampa* and *Porthesia similis;* the urticating hairs in these species were from ·1 to ·2 mm. in length, sharply pointed at the base and finely barbed, the apex in the latter species being trifid. The number of these hairs on a single larva of *C. processionea* had been estimated at 720,000. He said that the urticating property of the hairs appeared to be mechanical: there was no evidence of any poison glands. On this point the experiments of Staff-Surgeon Lübbert (Judeich u. Nitsche, Lehrb. der Mitteleur. Forstius., p. 907) appeared to him to be conclusive. They showed that no reagent was capable of extracting any irritating substance from the hairs, that they retained their urticating properties without alteration and indefinitely, and that these properties were unaffected by treatment with acids, alkalies or other reagents, or heat, as long as the structure of the hair remained unaltered. Moreover, hairs softened by prolonged maceration, *e.g.*, in alcohol, lost their power of irritation, but regained it fully on being dried. He had examined the two hairs extracted from the eye of Mr. Lawford's patient, and found them to be identical in all details with the shorter and stiffer hairs of the caterpillar of *Lasiocampa rubi.*

Mr. Lawford said he had had some difficulty in discovering hairs in the lid, and he thought that the symptoms in the case in question were not to be explained by mechanical irritation alone due to the presence of hairs in the tissues. The subject was a new one to him, and he had looked up all the medical literature bearing on it. Lord Walsingham, Mr. Tutt, Prof. Poulton, Canon Fowler, and Mr. Jacoby made some remarks on the subject.

Papers, etc., read.

Dr. F. A. Dixey read a paper entitled "On the Relation of Mimetic Patterns to the Original Form," in which he dealt with (1) the Gradual Growth of a Mimetic Pattern; (2) Sexual Dimorphism in Mimetic Forms; (3) Reciprocal

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Mimicry between Inedible Forms, and (4) Divergent Members of Inedible Groups. The paper was illustrated by coloured drawings of the species referred to. The author said:

(1.) An objection often brought against the theory of mimicry was the difficulty of imagining the first stages in the production of a mimetic pattern. In reply to this Fritz Müller urged that mimicry must be supposed to have originated between forms that already bore considerable resemblance to each other. His contention, though hardly confirmed by the instances on which he relied, is sound in so far as it emphasises the fact that the process of mimetic assimilation depends rather on the development of old than on the starting of new features. An illustration of this is afforded by a comparison of the non-mimetic butterflies, *Pieris locusta* and *P. phaloe*, with the mimetic species of the closely allied genus *Mylothris*, and with *Heliconius numata*, which serves as the model for the latter; all these being neotropical forms. The whole series shows (i.) that a practically perfect mimetic pattern can be evolved by gradual stages without any abrupt change; (ii.) that it is not necessary that the forms between which mimicry originates should possess considerable initial resemblance; (iii.) that so small a beginning as the basal red patches on the underside of the hindwing of many Pierines gives sufficient material for the assimilative process to work upon.

(2.) The feeble development of the mimetic pattern in the males of this group calls for some explanation. No doubt the females stand in greater need of protection, but does there exist any active check on the fuller assumption of mimetic patterns by the males? The retention of the original white by the latter sex has been in similar instances attributed to female choice; Mr. Wallace on the other hand thinks it due to the difference of habits in the two sexes, the females alone flying in company with the mimicked *Heliconii*. But this leaves unexplained the presence of a *partial* mimetic pattern in the male. The probability is that although on the wing it may be advantageous rather than otherwise to the male, as Mr. Wallace thinks, to be taken for an ordinary white butterfly, yet when the insect is at rest, and settled

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with the wings erect, any Heliconine resemblance would be to some extent protective; and the whole aspect of these males, the underside alone of which shows any mimetic features, is the resultant of these two divergent tendencies. The mimetic features of the male cannot be regarded as a mere incidental result of the more complete transformation of the female, because in many species of other groups the female is completely mimetic while the male shows no approach whatever to a mimetic change; moreover, there is a species of *Hesperocharis* (*H. hirlanda*), in which not only the male but both sexes show a partial mimetic pattern no further advanced than that of *M. lorena* ♂ or *M. pyrrha* ♂. It is difficult to believe that in this case the pattern is not in some degree protective.

(3.) Red basal spots in combination with a white or yellow costal streak on fore or hindwing are found alike in some of the mimicking Pierines, and of the mimicked *Heliconii*. These spots are too widespread in the Pierine subfamily to have arisen from imitation of the *Heliconii*. Their definite presence in the latter is probably due to reciprocal mimicry between distasteful forms, as previously suggested by the author. The same principle is applicable in a very large number of mimetic groups, all or most of whose members are probably inedible (Müllerian mimicry or convergence). It would not be applicable in the longer-known cases where a distasteful is mimicked by an edible form (Batesian mimicry).

(4.) A curious case of a mimetic assemblage is afforded by the Pierines *Euterpe tereas* and *E. bellona*, together with their respective models *Papilio zacynthus* and the *Heliconii* of the *erato* group. The *Papilio* and the *Heliconii* have no close resemblance to each other; but appear to be held together, as it were, by the intermediate Pierines. If the *Heliconii* are considered as the models for the whole group, the question arises, why *E. tereas* should copy a model (*P. zacynthus* ♀) and not a very good one, instead of the original distasteful model (*Heliconius*). It is more probable that here also we have an instance of an inedible (Müllerian) association; this conclusion being strengthened by the fact that a

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certain amount of give-and-take, or reciprocal mimicry, seems to have occurred not only between the *Heliconii* and the Pierines, but also between the Pierines and the *Papilio*.

Dr. Dixey concluded by urging the importance of accurate observations in the field, especially as regards the habits, postures, modes and times of flight, prevalence, seasonal occurrence and exact distribution of all forms associated in mimetic relations. Only by such means, in conjunction with experiments conducted in the midst of their natural surroundings, could the suggested explanations of these complex phenomena be satisfactorily and finally tested.*

Prof. Poulton expressed his gratification with the paper, and at the fact that the Hope Collection under his charge had afforded material for the work. He thought the result of the paper was to extend the theory of Fritz Müller over some of the ground hitherto believed to be covered by the theory of Bates. Mr. Blandford, Mr. Tutt, and Prof. Meldola continued the discussion.

Dr. Sharp contributed a paper entitled "The Rhynchophorous Coleoptera of Japan. Part IV."

February 19th, 1896.

Professor Raphael Meldola, F.R.S., President, in the Chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Election of Fellows.

Mr. T. Hudson Beare, of Park House, King's Road, Richmond; Mr. William James Kaye, of Worcester Court, Worcester Park, Surrey; and Mr. Charles H. Dolby-Tyler, of the British Consulate, Guayaquil, Ecuador, South America, were elected Fellows of the Society.

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* The greater part of the above abstract has appeared in the "British Association Reports for 1894."—H. G. and W. W. F., Eds.

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Exhibitions, etc.

Dr. D. Sharp exhibited preparations of *Dytiscus latissimus* and *Cybister roeselii*, to show the so-called secondary wing, noticed by Meinert. He stated that this structure is only a part of the elytron, to which it is extensively attached, and that he considered that it corresponded with the angle at the base of the wing seen in so many insects that fold their front wing against the body. He could not consider that this structure afforded any support to the view that the elytra of beetles correspond with the tegulæ of Hymenoptera rather than with the front wings. He also exhibited specimens of Neuroptera, and pointed out that this secondary wing agreed in position and structure with a small lobe on the front wing of Raphidia. Mr. McLachlan, Prof. Meldola, and Mr. Gahan made some remarks on the subject.

Mr. C. G. Barrett exhibited, for Dr. H. G. Knaggs, cells of *Retinia resinana* formed of resin but lined with wax. A portion of the cell had been removed and the resin dissolved away with spirit, leaving a slight film of wax (*cf.* Ent. Mo. Mag., Nov., 1895, pp. 251, 252). Mr. Tutt stated that a secretion of wax had been detected by Dr. Chapman in *Parnassius apollo*. Prof. Meldola suggested that as Dr. Knaggs had shown how to separate the resin from the wax it would be of interest to make a chemical investigation of the latter, since a sufficient supply of this material could easily be obtained. No insect wax, with the exception of that of the bee, had been submitted to investigation by chemists. Mr. Hampson and Mr. Blandford continued the discussion.

Mr. Gahan exhibited drawings of the specimen of *Dyscritina longisetosa*, which was shown by Mr. E. E. Green at the last Meeting of the Society, and pointed out that these drawings confirmed the view which he then expressed as to its affinities. Except as regards its caudal appendages the insect had, he said, all the characters of an earwig. He regretted that no drawing, showing the ventral surface, had yet been prepared by Mr. Green. Mr. McLachlan, Dr. Sharp, and Mr. Green made some remarks on the subject.

Mr. B. A. Bower exhibited specimens of *Argyresthia*

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atmoriella, Bankes, taken in Kent, in June, 1894, a recent addition to British Lepidoptera.

Mr. E. E. Green read notes on the habits of the Indian ant, *Œcophylla smaragdina*, Fabr. He said he believed that at some previous meeting of the Society, Mr. Ridley, of the Singapore Museum, made some remarks on this ant and its supposed habit of using its own larvæ as web-spinners in the formation of its nest, but he had not been able to find anything on the subject in the Proceedings. He stated that he was now able to produce corroborative evidence from an independent source. The facts were noted by his friend, Mr. W. D. Holland, of Balangoda, Ceylon, a most careful observer. Mr. Green exhibited the specimens referred to by Mr. Holland, and pointed out that the larvæ were still tightly grasped by the jaws of the ants, and he thought it probable that other web-spinning ants utilized their larvæ in the same way. He also read the following extracts from Mr. Holland's letters to him on the subject:—

"I send by this post a small bottle with 'red ants,' and the small grub they use to sew, or rather stick, the leaves together when making their nests. Their *modus operandi* is to pull leaves together with their jaws, great numbers acting in combination. When the leaves are in position they are sewn together by the ants taking the grubs in their jaws and passing them backwards and forwards from edge to edge of the leaves to be sewn together. Where the grub touches the leaf a thread is drawn out, adhering to the leaf much as a spider attaches its thread. This process is repeated from edge to edge until a felted waterproof kind of papery stuff is made, somewhat resembling cigarette paper, by an innumerable number of threads glued or felted together. They also use these grubs to spin webs when fortifying the tree in which they live against the small ants with which they are continually at war. Leaf stipules, dirt, small stones, etc., are brought by the 'red ants' and inserted in the web spun with the aid of the small grubs. On the tree I am watching now there is nearly a complete circle round the trunk (a foot or more in diameter). If you slightly part two leaves in a red ants' nest, say a quarter of an inch, you will be able to see the

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process of fastening together again, though it is more difficult to see in this case, as the sewing is done from the inside. I saw it done myself, but could not make out the process to my satisfaction until I saw the ants fortifying trees, which, being done in the open, made the matter plain. Until then I could not make out what the 'white thing was in the ants' mouth.'"

Papers, etc., read.

Mr. G. F. Scott-Elliot read a paper entitled "Notes on Flower-Haunting Diptera." The author pointed out that some of the higher types of Diptera appeared to prefer red and blue flowers, and oftener visited the complicated types of plants than the smaller Hymenoptera. He also alluded to the effect of insect visitors in isolating particular individuals. Prof. Meldola expressed himself much interested in the paper, and stated that although he was aware, from the writings of Hermann Müller and others, that Diptera played an important part in the fertilization of flowers, he was unaware of the very great importance which these insects possessed for the function of pollination until he heard Mr. Scott-Elliot's paper. He also called attention to the urgent need of a manual of British Diptera. Mr. Roland Trimen mentioned that in South Africa some species of Orchidaceæ were fertilized by Diptera. Dr. Sharp said Prof. Plateau thought that neither the colour nor form of the flower played any part in attracting insects. Mr. McLachlan remarked that the flowers of Scrophularia possessed a great attraction for wasps. Lord Walsingham enquired whether any observation had been made as to the Diptera which visited differently coloured flowers of the same species, such as Petunias. Mr. Barrett, Mr. Green, and Mr. Scott-Elliot continued the discussion.

Mr. Tutt read the following paper, by Prof. A. Radcliffe-Grote, entitled "On the Nomenclature of the Geometridæ":—

"In the Trans. Ent. Soc. Lond., 53, 1892, appeared an extended paper by Mr. Edward Meyrick, on the classification of the *Geometridæ*. The object of the present notice is to offer comment on certain of the generic titles without dis-

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cussing the systematic arrangement of the group therein adopted. At the outset I may say it is a matter of regret that Mr. Meyrick has not seen fit to give the name of the typical species of each genus and the date of the generic title. This would have made it easier for the nomenclator to control the application of the terms, and might have allowed me to extend the limit of this brief notice at the present time.

"*Geometra*, Meyrick, *l. c.*, 96. To this generic term Mr. Meyrick cites Linné as authority, consequently *papilionaria* must be assumed by him as type, since it is the only Linnéan species included. But *papilionaria* became in 1806 (1811) the type of *Terpne*, Hübner, consequently the employment of *Geometra* for this type is no longer admissible. The same species is also made the type of *Holothalassis*, Hübner, Verzeichniss, 285. I may say here, that in the Systema Lep. Hildesiæ, Aug. 15, 1895, I state my inability to give the type of the Linnéan genus *Geometra*. Latreille, Gen. Crust. Ins., 218, 1809, says: 'Linnæus genus *phalæna* in septem sectiones distribuit:' *Attacus*, *Bombyx*, *Noctua*, *Geometra*, *Tortrix*, *Pyralis*, *Tinea*, *Alucita*. I have recently been able to fix the type of *Bombyx* as *mori*, through Schrank, 1802, who restricts the term to *mori* and *versicolor*, and again through Ochsenheimer, 1810, who restricts the term still further by making *versicolor* the type of *Endromis*, leaving *mori* as the true type of *Bombyx*. I have also shown that the type of *Pyralis* must be assumed as *pinguinalis*, again through Schrank, 1802. But for the terms: *Noctua*, *Geometra*, *Tortrix*, and *Tinea*, I can find, as yet, no type, and generic terms without a type are useless in nomenclature, being virtually *nomina nuda* until their types are ascertained.

"*Plemyria*, Meyrick, *l. c.*, 71. This is apparently the first genus erected by Mr. Meyrick at the expense of *Cidaria* of Lederer and Staudinger, as well as of Speyer, and continental writers. The generic title *Cidaria* is not only preoccupied, but it is later than a number of names proposed for members of the Group by Hübner in the Verzeichniss, 1818 (1816—1827). Mr. Meyrick includes in his genus *Plemyria*, the species *hastata*, L., and has thus apparently

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overlooked the fact, that this species is the type of *Rheumaptera*, Hübner, 1806 (1811), and that this is the earliest generic term applied to any member of the present group. The initial fact, with which any study of this series must commence, is expressed by this name. Beyond *Rheumaptera* for *hastata*, no generic title seems here to be quite assured. Conceding Mr. Meyrick's species to be correctly associated, his genus, *Plemyria*, must give way to *Rheumaptera*, with *hastata* as type. But there are further objections to *Plemyria*. It is twice used in the Verzeichniss; the second time for *fluviata* (*gemmata*), for which species it not only falls as a synonym, but the species itself is taken by *Ochyria*. The first time it is used (p. 327) by Hübner for *rubiginata*, *fluctuata*, *procellata*, *stragulata*. Not one of these names occurs in Mr. Meyrick's list of species. Even if a specific title there cited covers one of Hübner's original species of *Plemyria*, the fact should have been mentioned, to avoid the appearance of using a generic name for different species from any of those for which it was originally proposed.

"*Eustroma*, Meyrick, *l. c.*, 71. No mention is made by Mr. Meyrick of the fact, apparent both from his diagnosis and the list of species given by him, that this is equivalent to *Lygris* of Lederer, 1852; the type of which is *populata*. For this structural type the term *Petrophora*, Hübner, 1806 (1811), is incorrectly used by Dr. Packard, since the type of this name is *maeniata*. Consequently *Petrophora* must be used instead of *Ortholitha*, Hübner, which falls as a synonym. The trinomial use of *Petrophora*, in the Sammlung, is not of authority, since our nomenclature is binomial. And now as to *Eustroma*. It is proposed in the Verzeichniss, 335, for *suffumata*, *prunata*, *silaceata*, and *reticulata*. It contains thus two species included by Lederer in his genus *Lygris*, and Mr. Meyrick's course virtually amounts to this, that he supplants *Lygris*, with its type *populata*, by *Eustroma*, with the type *reticulata* or *prunata*. The genus *Lygris* is proposed by Hübner on the same page, and immediately following, for *pyropata achatinata*, *populata*, and *pyraliata*. The genus *Lygris*, of Lederer, defined by the character of a hair pencil on the forewings of the male primary beneath, contains as European

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species: *reticulata*, *prunata*, *pyropata*, *testata*, *populata*, *associata*. Thus Hübner's genus *Lygris* is almost a clean one for this type; as far as he knew the species, he left two in *Eustroma*, while in *Lygris* he includes only one dissonant, while similar looking, yellow winged form, which would apparently fall into the section *Cosmorhoe* of *Rheumaptera*, were we to adopt Lederer's classification, and name his sections of *Cidaria*. Upon this ground Lederer's action in choosing *Lygris* instead of *Eustroma* may be defended. But in any event his action cancels the effect of the fact that *Eustroma* precedes *Lygris* on the same page. From that time the type of *Eustroma* must be sought in either *suffumata* or *silaceata*, the remaining species after his restriction. Both these and *fluviata* are referred by Mr. Meyrick to *Hydriomene*, but this reference should clearly make *Eustroma* a synonym of *Hydriomene* (*teste* Meyrick), and has no power to disturb Lederer's prior action as to *Lygris*. In these genera authors are at variance as to their character and extent, but a structural type once precised by diagnosis, and with species covered by the original application of the generic term should be left as permanent. Another author may properly insist upon *suffumata* or *silaceata* as distinct from *Hydriomene*, and restore *Eustroma* for one of these, which became the true types of *Eustroma* after Lederer's course with regard to *Lygris*, and the consequent removal of *reticulata* and *prunata* to that genus. In this way we shall never gain ground in fixity, if each succeeding author has the right to overturn the proper work of his predecessor. Lederer gives us *Lygris populata* as a second landmark in the Cidarian wilderness. In the absence of any statement by Mr. Meyrick, showing that Lederer's prior action should not be followed, we may assume that *Lygris* is the proper title for the genus, and that the type is *populata*. It would seem, indeed, that Mr. Meyrick has here, as perhaps elsewhere, taken simply the oldest generic name he found for any one of the species he would include under his genus, without reference to its later use or restriction. That this may sometimes be really the case appears possible from Mr. Meyrick's use of the following term.

, Meyrick, *l. c.*, 118. Hübner employs this

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term in the Verzeichniss, for *syringaria* and *firmiana*. Unless these two are identical or congeneric, and from the extent of my present knowledge I must assume neither to be the case, the type of *Hygrochroa* became, in 1828, *firmiana*, Cramer, through the action of Stephens in taking *syringaria* as the type of *Pericallia*. Since Stephens' term is preoccupied by Hübner, Verzeichniss, 182, for *Pericallia matronula*, I have labelled the material in the collection Roemer Museum, *Cyphosea syringaria*, L. sp. I can attain to no knowledge that Cramer's species is the same as that of Linné, which would justify Mr. Meyrick's use of *Hygrochroa*, while all the authorities which I am now able to consult, consider *syringaria* as peculiar and *sui generis*.

"*Selenia*, Meyrick, *l. c.*, 118. I had previously shown that *Eutrapela*, Hübner, 1806 (1811), must be used for this genus with the type *lunaria*.

"*Ennomos*, Meyrick, *l. c.*, 114. This term is correctly employed by Mr. Meyrick, since *Fugonia*, Hübner, commonly used for the species, is preoccupied in the Verzeichniss, 86, 1818. Its use for a genus of Butterflies is sanctioned by Mr. Scudder. The type of *Ennomos* is *alniaria*, L. sp.

"*Diastictis*, Meyrick, *l. c.*, 108. The type of this term is *artesiaria*. The same term is subsequently used for *argyralis* in the Verzeichniss, but its use in the *Pyralidæ* must of course be abandoned. Mr. Meyrick, however, includes with *artesiaria* the type of *Cymatophora*, Hübner, 1806 (1811). Conceding the correctness of Mr. Meyrick's grouping, then this genus would have to be called *Cymatophora* with the type *roboraria*. The species generally included under *Boarmia*, Tr., appear to be divided between *Diastictis* and *Selidosema*, by Mr. Meyrick. The American species formerly classed under *Boarmia* have been separated by Dr. Packard under *Cymatophora*, and the use of this term, at a later date, in the *Thyatiridæ* has been properly abandoned. Again here the use of *Cymatophora* as part of a trinomial term in the *Sammlung* does not affect the question. Its type is *roboraria*, but what American or European species agree with this type it is not for the nomenclator to decide. All agreeing with this type must be referred to *Cymatophora*. The exceptional clauses in Mr. Meyrick's diagnosis of *Diastictis*

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allow him to further include, in entire disagreement with Continental authorities, the type *melanaria*. This species is made the type of *Rhyparia*, Hübner, Verzeichniss, 805. The term is there used by Hübner for both *grossulariata* and *melanaria*, and doubtless the correspondence in colour and maculation induced their association. Since *Rhyparia* is pre-occupied, *ibid.*, 188, I have labelled the species in the Coll. Roemer Museum as *Hemipyrrha melanaria*, L., sp.

"*Bupalus*, Meyrick, *l. c.*, 107. The type of *Chleuastes*, Hübner, 1806 (1811), is *piniaria*, and I know of no sufficient reason why this term should not be used in place of Leach's, over which it appears to have decided priority.

"*Leucophthalmia*, Meyrick, *l. c.*, 91. For this genus the term *Cyclophora*, Hübner, 1806 (1811), with the type *pendularia*, should be employed.

"*Calothysanis*, Meyrick, *l. c.*, 91. For this genus the term *Erastria*, Hübner, 1806 (1811), with the term *amata* (*amataria*) should be used. The employment of *Erastria* in the *Agrotidæ*, being of subsequent date, should be abandoned.

"A study of Mr. Meyrick's paper is rendered a little difficult by the absence of index and of both generic and, in part, specific synonyms. The omission of these details in a local list of known species and genera would not be felt, but in a new classification becomes a hindrance to its comprehension. The very interesting, but somewhat decidedly expressed, remarks upon the origin and phylogeny of the different groups, remain somewhat in the air, since their sufficient support from metamorphological studies is wanting."

A discussion on the rules of nomenclature followed, in which Lord Walsingham, Prof. Meldola, Mr. Hampson, and Herr Jacoby took part.

March 4th, 1896.

Walter F. H. Blandford, Esq., M.A., F.Z.S., Vice-President, in the Chair.

Donations to the Library were announced, and thanks voted to the respective donors.

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Election of a Fellow.

Mr. P. Marshall, M.A., B.Sc., F.G.S., of Canterbury College, Lincoln, New Zealand, was elected a Fellow of the Society.

Exhibitions, etc.

Mr. Percy H. Grimshaw exhibited specimens of *Cephenomyia rufibarbis*, Meigen, a new British Bot-fly parasitic on the Red Deer. He said that the specimens were collected by Mr. L. W. Hinxman, in Ross-shire, in June and July, 1894, and in the Cairngorm Mountains, in 1895.

Mr. C. G. Barrett exhibited, for Mr. Porritt, a black variety of *Polia flavicincta*, taken at sugar in his garden at Huddersfield; a variety of *Cosmia trapezina* with a blue-black central band; and a variety of *Mania typica*, with pinkish-white central markings, bred by Mr. Turnstall of Huddersfield.

Mr. A. H. Jones exhibited specimens of the following butterflies captured at Coomassie by Major Henry P. Northcott during the recent expedition, viz., *Papilio zenobia*, *Elymnias bammakoo*, *Limnas alcippus*, *Romaleosoma gausape* (var.), *Catùna cœnobita*, *Terias sengalensis*, and *Neptis nemetes*.

Sir John T. D. Llewelyn, Bart., M.P., exhibited specimens of a small species of Diptera which he believed to be parasitic on *Trochilium sphegiforme* as he had bred a number from that species. He remarked that *T. sphegiforme*, although one of the most local and rarest moths in this country, had occurred last year on the estate of Sir James Hills-Johnes, K.C.B., at Dolau Cothy, Carmarthenshire, in such numbers in the larval state as almost to destroy the whole of the alders growing there. Mr. G. H. Verrall said that the insects belonged to a species of *Phora*, possibly *Phora rufipes*, which fed on almost everything but were not considered to be truly parasitic; they seemed blacker than typical specimens of that species.

Mr. Hampson exhibited an exotic species of Locustidæ which Lord Walsingham had found in his conservatory at Merton Hall, Norfolk. He stated that Lord Walsingham had not imported any exotic plants for some years.

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Dr. Sharp exhibited specimens of the pupæ of *Micropteryx* (probably *semipurpurella*) and drawings to illustrate their structure. The pupæ were sent to him by Dr. Chapman, who had described their peculiarities in the Transactions of the Society in 1898. Dr. Sharp considered the pupa to be that of a Trichopterous insect; most of its structures were those of Trichoptera, and the account given by Dr. Chapman of its emergence showed that this was essentially the same as that of Trichoptera. He remarked that the imago of this division of *Micropteryx* had been already shown to approach Trichoptera in several respects, and suggested that it should be treated as a group of Trichoptera whose larvæ are not aquatic in habits. If this course were not adopted he felt clear that Trichoptera could not be maintained distinct as an order from Lepidoptera. He remarked on the peculiar projection from the head of the pupa of *Micropteryx*, and suggested that it might be comparable with the head-vesicle of the nymph, or primary pupa, of Lepidoptera. He also called attention to the importance, for a classification of Lepidoptera, of obtaining a full knowledge of the structure and life-history of *Eriocephala calthella*. Mr. McLachlan said that so long ago as 1865 he had suggested the close affinity of *Micropteryx* to the *Trichoptera*; the opinion then formed had since been much strengthened, but he was not disposed to admit co-ordinal relationship. Mr. Hampson, Mr. Barrett, and Mr. Blandford also took part in the discussion which ensued.

Mr. McLachlan exhibited a singular instance of monstrosity in a Dragon-fly. The insect was a male of *Hetærina occisa*, Hag., from Venezuela. On the left side were three wings, two mesothoracic and the other metathoracic; on the right side only one wing, the metathoracic. The supplementary wing on the left side was inserted almost immediately beneath the ordinary wing; it was normal in form and neuration, but the red pigment at the base (fully developed in all the other wings) was not evident, the wing in this respect being similar to those of highly immature examples of the same species.

Mr. E. E. Green exhibited a larva of an Homopterous

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insect—one of the *Cicadinæ*—from Ceylon, having what appeared to be a head at its caudal extremity. He pointed out that the larva had caudal appendages which might be mistaken for hairy antennæ, and pigment spots resembling eyes on the antepenultimate segment of the body. The insect walked either backwards or forwards, and when first seen looked like a beetle of some kind, the caudal extremity representing the head.

Papers, etc., read.

Mons. Louis Péringuey contributed a paper entitled "Descriptions of New Species of South African Coleoptera, chiefly from Zambesia."

Dr. Sharp read a paper, by Professor Williston, entitled "On the Diptera of St. Vincent, West Indies. Part I."

March 18th, 1896.

Professor Raphael Meldola, F.R.S., President, in the Chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Election of a Fellow.

Mr. T. A. Gerald Strickland, of Oakleigh, near Ascot, Berkshire, was elected a Fellow of the Society.

Exhibitions, etc.

Mr. C. G. Barrett exhibited a series of drawings of varieties of British Lepidoptera in the collection of Mr. S. J. Capper, of Huyton Park, Liverpool. The drawings, which were beautifully executed, were by Mr. S. L. Mosley of Huddersfield, and comprised 389 figures, representing 139 species, of which 33 were butterflies and 50 moths. Herr Jacoby enquired whether any record had been kept of the localities in which these varieties had been caught, or of the

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conditions under which they had been bred. Mr. Barrett in reply stated that none of the varieties exhibited had been obtained by breeding under artificial conditions for the purposes of experiment, but they were natural varieties, possibly due to the influence of the climate or soil, or to the latitude of the localities where they were caught or bred. Mr. Porritt added that Mr. Capper had made a special collection of the Yorkshire forms of *Arctia lubricipeda*.

Mr. J. J. Walker, R.N., exhibited a specimen of *Procas armillatus*, taken on Durland Hill, near Chatham, during the present month.

Herr Jacoby exhibited a specimen of *Loxoprosopus cerambοides*, Guér., from Brazil.

Mr. E. E. Green exhibited the eggs of some species of Locustidæ extracted from the stem of a young Cinchona tree at Punduloya, Ceylon. He said the species of the parent insect was undetermined; it was possibly either a *Cymatomera* or a *Cyrtophyllus*, both of which possess large sabre-shaped ovipositors. A slit half an inch deep and more than two inches long had been cut into the hard wood, in which the eggs had been symmetrically deposited, edge to edge, with the coloured part inwards. The greater part of each egg was of fine texture, and coloured green; but at the extremity from which the young insect would make its exit the egg shell was soft, pliant, and beautifully reticulated. The row of flattened green eggs lying side by side resemble an acacia leaf, but as they are concealed within the stem the resemblance was apparently without motive. It seemed curious that as the eggs were embedded they should be brightly coloured. Mr. McLachlan and Dr. Sharp made some remarks on the subject.

Papers, etc., read.

Mr. Green read a short paper entitled "Notes on *Dyscritina longisetosa*, Westw." He remarked that drawings of the species had been exhibited by him at a recent meeting of the Society. Dr. Sharp said Mr. Green seemed to think that the insect was an earwig, but he could not accept it as belonging

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to the Forficulidæ. He thought that further specimens for examination were required before attempting to determine its position, which was quite doubtful at present.

Mr. W. F. H. Blandford communicated a paper entitled "Descriptions of New *Scolytidæ* from the Oriental and Austro-Malayan Regions."

April 1st, 1896.

Professor Raphael Meldola, F.R.S., President, in the Chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Election of Fellows.

Mr. Luke Bishop, F.R.G.S., of 3, Tokenhouse Buildings, E.C.; and Mr. Robert Nesham, of Utrecht House, Clapham Park, S.W., were elected Fellows of the Society.

Exhibitions, etc.

Mr. Champion exhibited, on behalf of Mr. Blatch, specimens of *Quedius riparius*, Kellner, captured in February last on the banks of running streams at Porlock, Somerset. He remarked that the insect was an interesting and unexpected addition to the British list, and the second recent novelty from the west country, the other being *Ochthebius lejolisi*, Muls. and Rey, found at Ilfracombe in June last by Mr. Bennett. It would seem to indicate that further additions to our list of Coleoptera might be expected from the country south of the Bristol Channel. He added that Mr. Waterhouse had informed him that he had seen specimens of the Quedius from Wales and Scotland. Mr. Waterhouse said that Mr. Chitty and Mr. Beevor had shown him specimens of *Quedius riparius* recently collected by them.

Mr. Champion also exhibited a small collection of Coleoptera made by Mr. O. V. Aplin in Southern Tunis during various expeditions inland from Gabes. The collection included some interesting Tenebrionidæ of the genera *Pimelia* and *Adesmia*. Mr. Aplin noticed specimens of these

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insects impaled by shrikes. Dr. Sharp, Mr. R. Trimen, and Mr. McLachlan made some remarks on the subject of the impalement of insects by birds.

Mr. Goss exhibited, for Mr. Cameron, an apterous male of *Mutilla contracta* taken by Mr. Rothney in Barrackpore, India. The specimen was stated to be the first recorded instance in this species of a wingless male, and was also abnormal in having the thorax incised laterally.

Dr. Sharp called attention to the fact that at a recent meeting of the Society (March 20th, 1895, see Proc., 1895, p. x.) a specimen of a supposed dimorphic form of one of the species of *Dytiscus* was examined, and Prof. Stewart enquired whether any anatomical examination had been made of the sexual organs. Dr. Sharp said that in the Comptes Rendus Soc. Bordeaux, 1894, there was an account of the examination of the sexual organs of the supposed second form of *D. marginalis* by Mons. Peytoureau, who came to the conclusion that it was really a distinct species, which he called *D. herbeti*. Dr. Sharp suggested that there must be some doubt as to M. Peytoureau's conclusion as there was a series of these double forms in connection with this genus, and it would be a very extraordinary fact if in one case the second form should be a distinct species, while in other species of the same genus the form corresponding to it should be only a variety. Mr. Champion and Mr. Tutt made some remarks on the subject.

Prof. Poulton exhibited examples of the type labels now in use in the Hope Collection at Oxford, and illustrated their employment by projecting on the screen, by the lantern, a photograph of the Westwood types of African *Eusemiæ* described in F. Oates' "Matabele Land" (Lond., 1881). He said that such labels, having been once set up in type, could be reproduced in electrotype very cheaply and efficiently. Black ink was considered better than red on account of its greater permanence. Mr. Verrall said he was of opinion that no species should be described from a single type, but from many specimens, and he wished every so-called "type" could be destroyed as soon as a species had been described from it. He knew of cases in which a "species" had been

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described from a single female specimen in bad condition. Mr. Blandford explained the system of labelling types in the Brussels Museum. Dr. Sharp, Prof. Meldola, Mr. McLachlan, and Prof. Poulton continued the discussion.

Mr. Blandford exhibited a series of lantern slides showing the uses to which photography could be put in entomological illustration. The photographs shown included various *Saturniidæ*, *Vanessidæ*, species of *Mamestra*, *Tipula*, *Ophion*, *Carabus*, *Lucanus*, *Sitones*, etc., as well as one or two examples of insect-injury, and a view in Windsor Park showing oaks defoliated by *Tortrix viridana*. Mr. Blandford said that the photographs were taken without any considerable practice in photography; that good and well-set specimens were desirable for reproduction; the colour-values had to be arrived at by the careful use of orthochromatic methods, and a large lens of good focal length should be used. Careful attention had to be paid to the lighting of the objects, a point in which entomological experience was of great value. The shadows cast by the insects were objectionable and could not satisfactorily be "blocked out." He said that they could, however, be done away with by a method used for some time by himself, and recently described in an American journal. The insects were pinned on to small blocks of cork stuck on a sheet of ground glass, which was illuminated from behind by white or grey paper. Some experiments, which unfortunately had to be abandoned, with a specially constructed lens, showed that it might be possible to obtain satisfactory photographs of such small insects as *Sitones* or *Apion* with an amplification of two to five diameters. Prints could be made from the negatives by photo-mechanical methods, but a large number of the illustrations that have been thus published were of no value owing to the inferiority of the process adopted. Owing to the expense, and still more, the difficulty of obtaining good illustrations of insects, photography deserved more attention than it had yet received.

Prof. Meldola expressed surprise that photography had hitherto been so little employed in the illustration of works on Entomology.

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Papers, etc., read.

Prof. Poulton read a paper entitled "On the Courtship of certain European Acridiidæ." The author said that these observations upon the courtship of Swiss Acridiidæ were made in the exceedingly favourable weather at the end of August and beginning of September last year; and that he was much indebted to Mr. F. Jenkinson, of Cambridge, and Mr. F. V. Dickins for many independent observations and valuable confirmation. The observations were almost all made in the neighbourhood of the Weisshorn Hotel, high above Vissoye, in the Val d'Anniviers. Prof. Poulton stated that Dr. Sharp had been kind enough to name the species referred to in the paper. The sombre brown male of *Pezotettix pedestris* did not stridulate audibly and assumed no remarkable attitudes, but lay in wait for the female and leaped upon her unawares. The female almost invariably tried to escape from the male, but if he succeeded in holding her for a short time she submitted, and pairing took place. Before pairing the male was seen to nibble the female gently with his mandibles, and during the whole time that he was holding the female, both before and during pairing, the male continually moved his third legs up and down alternately. It was suggested that this movement may be a vestige of true stridulation, and that it may still perhaps be of value in influencing the female in some way. It was frequently observed that the females, although carrying males, and in some cases pairing, were extremely indifferent, hopping about, eating freely, and defæcating. By keeping very still it was possible to observe this and other species within a distance of six or eight inches without disturbing them. In strong contrast to *Pezotettix* was the behaviour of *Gomphocerus sibiricus var.* The males of this species courted the females with much ceremony, raising themselves in a very remarkable attitude, stretching out their four palpi, stridulating, and in some cases patting or stroking the female with their legs or perhaps antennæ. In spite of this a successful termination to courtship was never seen, although the males were continually pursuing the females. Although both

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sexes hopped freely when disturbed, the males invariably ran after the females, and the latter only tried to escape by running. In the case of *Stethophyma fuscum* the rivalry in stridulation between the males was very apparent. Two males were found fighting, and even then stridulation was part of the contest, and always seemed to produce a very irritating effect on the antagonist. In another case a male was seen attempting to pair with a female which was already paired, and in this case too stridulation played an important part in the advances made by the former. Stridulation was the chief or perhaps the only method of courtship in two species of *Stenobothrus*. In *Psophus stridulus* a rattling sound was made by the males during flight (probably by the wings), but they also made a curious kind of twitter with their legs when in the presence of the females. Prof. Poulton said that some slight observations upon *Œdipoda* (probably *Œ. cærulescens*) were made at Fribourg, but far more investigation was needed before it is possible to come to a conclusion as to the habits of this species during courtship. The habits recorded in the paper were greatly influenced by temperature, and it was found that certain phases of courtship could be most satisfactorily studied when the insects were first roused into activity by the morning sun. Prof. Poulton further stated that it was probable that the pairing time was nearly over in the case of some of the species under observation, and this would explain the great difference between *Pezotettix* and *Gomphocerus* in this respect. The localities where the observations were chiefly made, and the appearance of the three first named species, were illustrated by lantern slides projected upon the screen.

Prof. Meldola expressed great interest in the paper, and said that the observation of the habits of insects in the field seemed to be much neglected by many Entomologists. Dr. Sharp remarked that there was a greater variety in the organs capable of producing sound in the Orthoptera than was generally supposed.

Mr. G. F. Hampson read a paper entitled "On the Classification of Three Subfamilies of Moths of the Family Pyralidæ: the *Epipaschiinæ*, *Endotrichinæ*, and *Pyralinæ*."

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May 6th, 1896.

Professor Raphael Meldola, F.R.S., President, in the Chair.

Donations to the Library were announced and thanks voted to the respective donors.

Election of a Fellow.

Mr. Percy Evans Freke, of Step House, Borris, County Carlow, Ireland, was elected a Fellow of the Society.

Exhibitions, etc.

Mr. Champion exhibited specimens of *Amara famelica*, Zimm., from Woking, Surrey, a recent addition to the British list. He also exhibited, on behalf of Mr. Dolby-Tyler, a series of *Eburia quadrinotata*, Latr., from Guayaquil, Ecuador, showing variation in the number of the raised ivory-white lines on the elytra, there being sometimes an additional mark exterior to the short basal line and sometimes an additional one on the inner side of the second line. Mr. Gahan said he did not notice anything remarkable in the species except in the arrangement of the spots.

Mr. Horace Donisthorpe exhibited a specimen of *Pterostichus gracilis* with three tarsi on one leg, taken near Weymouth last April.

Mr. G. T. Porritt exhibited a series of *Arctia menthrastri* which he had just bred from Morayshire ova; the ground-colour of the specimens varied from the usual white, through shades of yellow, to smoky-brown.

Mr. Merrifield exhibited specimens of *Gonepteryx rhamni* bred from larvæ found in North Italy and Germany, the pupæ of which had been subjected to various temperatures. He said the general effect of high temperatures, up to 98° F., and of low ones down to 33° F. for twenty days, both of exposures were well endured and might doubtless with as be exceeded, was not considerable: the high appeared to cause an increase of yellow scales in

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the female, but he was not yet sure of this; in one exceptional case there was so much yellow as to make it in appearance almost intermediate between the two sexes. Low temperatures in general reduced the size of the orange discal spot on the forewings of both sexes, so that in a few it was scarcely visible; in this respect there was a resemblance to the var. *farinosa* from Eastern Europe, Armenia, and Syria, and the var. *nepalensis* from North-West India, and it would be interesting to learn whether these came from the plains or the mountains. He also exhibited some species of *Vanessa*, the result of experiments tried with a view to ascertain the extreme high temperature that the pupæ would bear, and its results. For the benefit of other experimenters Mr. Merrifield said he might mention that he had strong reason to believe that the greatest results were obtained by a very high temperature—95° to 102° F. for different species—for from 12 to 24 hours immediately after the pupæ had become hard or nearly so, gradually lowered afterwards, but still kept high—say 85° F. or more—till near emergence. Mr. Merrifield further exhibited some of these high temperature results. In *Vanessa atalanta* the breadth and brightness of the scarlet bands on all the wings would be observed, and the appearance of scarlet patches and clouds on parts ordinarily black; the scarlet patch close to and above the projecting shoulder in the middle of the scarlet band on the forewings and between it and the costa, he had not seen before described; another unexpected result and not, he thought, before noted, was the appearance of a long dash of grey-blue scales near the inner margin of the forewing, and on the inner side of the scarlet band. Some low temperature examples were added for comparison. In the high temperature *Vanessa urticæ* exhibited, the three well-known isolated spots on the forewings had in some almost disappeared, the blue was much diminished, and the outer border of the forewings was very much narrowed, especially tapering, almost to a point, at the anal angle; the outer edge of this border was very much lighter in colour, and the outer edge of the forewing appeared to be much less angulated than in normal specimens. In this species also, some low temperature forms were shown for comparison, and two of the Corsican *V. urticæ* var.

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ichnusa. Mr. Merrifield said that his high temperature examples resembled this local variety in some respects, such as the increase in area of the red colouring and its tendency to brick red, and the disappearance or great reduction of the three dark spots, but in the temperature specimens this effect extended to the third spot, the one on the costa, which was not the case in var. *ichnusa*; on the other hand, the cooled specimens closely resembled the var. *polaris*. Mr. Merrifield exhibited also some cooled *V. antiopa*, and a normal specimen for comparison; with this species he had not obtained results equal to those obtained and figured by Dr. Standfuss, but the comparative darkening of the border and great increase in the size of the blue spots would be noticed. It was very gratifying to find that the effects of pupal temperature on the imago, and their causes, were now being made the subject of systematic research, not only by Professor Weismann, but by several other highly qualified observers, Dr. Standfuss, Mr. E. Fischer, and others, and it might be hoped that they would be prosecuted and extended. He expected at a future time to offer some observations on the general results obtained. In the meantime it might be noted that what may be termed the *direct* effect of temperature in some cases might be taken as proved; also that, though, as a rule, the summer pupæ appeared to respond much the more readily to varying temperature, yet, in many species, among the *Heterocera* at all events, the colouring and markings were much affected by temperature applied in early spring to the winter pupæ.

Mr. Elwes asked if these experiments had been made on pupæ only or on the larvæ as well. Mr. Merrifield said that the results were only noticeable when the experiments were made on pupæ. The effect of them on larvæ was not apparent.

Mr. Kirkaldy exhibited ova of *Notonecta glauca* var. *urcata*, and read the following note:—

"In the Ann. Soc. Ent. France, 1875, p. 204, Régimbart briefly describes the oviposition of *Notonecta glauca*. He notes that in the stem of a rush or other allied aquatic plant, a separate incision is made for each ovum, which is inserted two-thirds of its length, the cephalic extremity protruding.

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The specimens before you—owing probably to the absence of rushes (*Juncus*) in the vessel, although *Anacharis*, which one would have thought suitable, was in abundance—are entirely external, affixed basally to the stalk by a glutinous substance as in the allied *Corixidæ*. That this basal-fixation is not usual is evident from the fact that the ova are but feebly adherent, dropping off upon a slight disturbance, whereas the ova of the *Corixidæ* are attached exceedingly firmly."

Mr. Tutt exhibited living larvæ of *Apamea ophiogramma* together with the grass on which it was feeding. He said the species was formerly considered rare in Britain, but was now found freely in any localities where Ribbon grass (*Digraphis arundinacea*) was plentiful. He enquired if the grass on which the larvæ were feeding was identical with the last named species. Professor Meldola said that perhaps Professor Marshall Ward (who was present) would look at the plant. Mr. Goss observed that the moth was common on the banks and on the islands of the Thames, between Kingston and Twickenham, and probably everywhere in the neighbourhood where Ribbon grass was abundant. Mr. McLachlan said the species was common about the Wandle some twenty-five years ago, and the President stated that he had taken it at Twickenham and Woodford, two widely divergent localities.

The Secretary read the following note from Mr. Meyrick:—

"In the report of the meeting held on Feb. 19th (Proceedings of the Society, 1896, pp. x–xv), is a short paper by Prof. A. Radcliffe-Grote, criticising my use of some generic terms in the group of *Lepidoptera* which he calls the *Geometridæ*. I was not present to hear this read, or I would have pointed out at the time that his criticisms all fall to the ground, because he has failed to recognize that I intentionally reject all the generic names of Hübner's 'Tentamen,' which he seems to suppose I have overlooked. I reject them because they are unaccompanied by any diagnosis, and in this I am supported by the great majority of zoologists. I think there are other good reasons for their rejection, but am content to rely on this, and shall continue to do so until a majority of

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zoologists decides in a contrary sense. It is sometimes stated that the generic names of the 'Verzeichniss' are unaccompanied by diagnoses, but this is not so; the characters used are, it is true, often based on markings only, but they are really diagnostic, and, in fact, more scientific than those of many later writers who have pretended to draw up structural definitions, which, after all, defined nothing. It must be remembered that the 'Verzeichniss' is analytical, the generic definitions consisting, in fact, not only of the characters immediately prefixed to the genera, but also of the others, defining each of the numerous divisions and subdivisions under whose heading the genus falls. "I refrain, then, from pointing out the inconsistencies and errors in Prof. Radcliffe-Grote's criticisms, because I reject the main assumption on which the criticisms are based. He must convince me that these names of doubtful value, doubtful date, doubtful publication, but undoubtedly undefined, are good, before I need discuss the application of them."

Prof. Meldola stated that there were two papers to be read, but that the Treasurer had given notice of a subject for discussion, and he would ask him to introduce his subject first. It was "A discussion as to the best means of preventing the extinction of certain British Butterflies."

Mr. McLachlan said that so long ago as 1893 he chose the subject of the decadence of British butterflies as a subject for a Presidential Address to the West Kent Natural History Society. The remarks he then made were published in the "Entomologist's Monthly Magazine" (June, 1893), in a somewhat abridged form, and he thought a good many present would remember the fact. He took it for granted that British butterflies were on the downward scale. It was certain that in the neighbourhood of London many butterflies, common about the year he was born, or earlier, had become extinct. Within the last fifty years, he thought three of our British butterflies—*Chrysophanus dispar*, *Lycæna acis*, and *Aporia crataegi*, had almost, if not entirely, disappeared. The species, being weakened by some circumstances or other, were unable to hold up against a bad season or a series of bad seasons, and so disappeared. There were suspicions gener-

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ally entertained that the action of collectors had had a good deal to do with such disappearances. That might or might not be. Then there were certain butterflies that were getting, year by year, more restricted in their range. One of these was *Melitæa cinxia*. He thought it had disappeared from its favourite places in the Undercliff of the Isle of Wight, and that if it existed at all, it was only in some of the woods more in the centre of the island. Whether it existed on the mainland of the South of England, he did not know, but he thought it did not. Mr. McLachlan then referred to the case of *Lycæna arion*, which was, he said, formerly common in the West of England, from Dorsetshire to Devonshire, but was becoming rarer year by year. In some localities the firing of the herbage had been a primary cause of its disappearance. In others, he was inclined to think that over-collecting had had a good deal to do with its disappearance, and this opinion was supported by the fact that where collecting had stopped, the insect was again becoming more common. It was discovered, about ten years ago, in Cornwall, and still existed there in considerable numbers, although he heard it was becoming rarer. One of the objects he had in bringing the matter forward was to see whether some plan could not be devised to protect local insects in their particular localities. He was not one of those who believed in the absolute power of man to exterminate species. But he did believe that in the case of a local butterfly, five or six energetic collectors could capture nearly every specimen on the wing on a particular day. He thought some plan should be devised for checking over-collecting. *Papilio machaon* flourished in one or two of the fens in the Eastern Counties, year by year, notwithstanding the ravages made on it. Had it the same habits here that it had on the Continent, it would have gone years ago; but in this country its larvæ apparently fed on a plant that only grew in these fens. But it was hard pushed, and only required a bad season or two to extinguish it altogether. He should hope to hear some remarks as to protecting the two species he had especially mentioned, viz.: *M. cinxia* and *Lycæna arion*. His idea was that one of the

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best plans would be the formation of a Committee of the Society (not composed necessarily of members of the Council), to consider the whole subject.

Prof. Meldola said he quite sympathised with the remarks of the Treasurer, and if he spoke then he must beg the Fellows to excuse his interference at that point, because he would probably soon have to leave the Chair in the possession of a Vice-President of the Society. It did seem to him very desirable that some steps should be taken, even although, as Mr. McLachlan said, there might be some doubt as to man's agency in the matter of extinguishing a lingering species. But if there was any doubt let the butterflies have the benefit of it, and let steps be taken to check the depredations of the avaricious collector, and, worse still, the dealers. As an abstract principle it was very well to make a general statement of that kind; the difficulty would come in reducing it to practice. He thought the Treasurer's suggestion that a Committee should be formed was at any rate a step in the right direction. He did not see how they were to go to work, but it had occurred to him that in a case of this kind, representations might be made to the local Societies with a view to approaching the landowner on whose property the rare species occurred, and asking him to take it under his care. He thought most landowners would see the importance of doing so. For insects the Society could not appeal to popular sentiment. The birds had the benefit of an Act of Parliament, but the Society could not appeal to the public for the preservation of butterflies. He thought some strong resolution passed by the Society, possibly in conjunction with kindred Societies, might produce some effect. The botanists were in an equal plight; they dared not reveal localities for fear of the extermination of species. He thought representations might be made to schoolmasters with the object of inculcating a little mercy into schoolboy collectors. The mere sight of butterflies at large was a pleasure of which we ought not to be deprived because certain persons desire to have long rows of them on pins. He was happy to believe that the practice of making pictures out of butterflies' wingshad died out.

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Mr. Goss stated that he could confirm what Mr. McLachlan said as to the disappearance of *Melitea cinxia* from many of its old localities in the Isle of Wight. In 1873 he found it in a cove at St. Lawrence, four miles west from Ventnor. A few years afterwards it had entirely disappeared from that locality, but was abundant at Mirables, some two miles further west, both in 1878 and 1882. Last year, in the old localities, he could not find a single specimen, but some miles further west they were plentiful. A great part of the ground over which they occurred in the new localities was almost inaccessible, and that possibly accounted for their preservation. Mr. Goss also said that in 1887 he explored the Norfolk Broads in a boat, for a range of from fifteen to twenty miles, landing on several fens, and found *Papilio machaon* extending over the whole district. He observed that in Cambridgeshire he was afraid it might in time disappear from its chief locality, Wicken Fen, but that it would linger on in some of the smaller fens—such as Chippenham, where the larvæ had been found on *Angelica sylvestris*. In Soham, near Wicken Fen, the children were paid by dealers to collect the pupæ, but only certain parts of the fen were accessible, the three years' growth being impenetrable. As to *Lycæna arion*, he said that, in 1866, when he was staying at Oundle, in Northamptonshire, for the purpose of collecting *Thecla pruni*, he was told by the Rev. W. Wall, formerly Rector of Thurning, Hunts (whose Rectory adjoined Barnwell Wold) that he had not seen *L. arion* since the wet summer of 1860. It seemed to have gone rather suddenly, and its disappearance did not appear due to collecting alone. Mr. Goss said that in 1876 he went down to Gloucester in June, and was taken by a correspondent to a spot eight miles distant, in the hill country, where *L. arion* was very plentiful. In the following year he visited the neighbourhood again, and found the range of the species was more extensive than was supposed, extending in scattered localities for about fifteen miles. He visited the locality again in the middle of June, 1883, a cold, wet, and late summer, but could find no specimens, and thought *arion* was extinct. It occurred again freely in 1888, after the grand summer of 1887. He also saw specimens in the same localities in 1890. Last year a friend of his went to the Cotswolds, on his recom-

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mendation, and had very fair success with the species over an extensive range of country. In South Devon, where *L. arion* was formerly abundant, its extinction was apparently caused by the burning of the herbage. As to the Cotswolds the specimens there were, as a rule, smaller than those from Devonshire or Cornwall, and were less brightly coloured. Some persons thought the species was dying out, but he did not think there was much chance of *L. arion* being entirely extirpated, in consequence of its wide range in the extreme south-west. *Aporia cratægi* had disappeared about 1882, but he did not think that such disappearance could be ascribed to over-collecting. It was locally abundant in the New Forest in 1866, 1868, 1869, and 1870, and had an extensive range in Monmouthshire and Glamorganshire, but disappeared suddenly about 1882 or 1883.

Mr. Elwes said the question seemed to him to divide itself into two parts: (1) The causes of the increasing scarcity and partial disappearance of our butterflies, and (2) The means of prevention. As to (1) he was perfectly ready to admit that greedy collectors might cause scarcity, which, followed by inclement and bad seasons, might lead to the total disappearance of a species, but he believed that climate, and a succession of bad seasons, had infinitely more effect than the efforts of all the collectors put together. We had not had a good farmer's year since 1874. With regard to the question of *L. arion* he happened to live in a district where it was extensively found. He had seen it in three or four places on his own property not less than ten or twelve miles from the place where it used to be most looked for; but, on the other hand, in two or three places where the species used to abound he could now find none. He was firmly convinced that if the butterfly had adapted itself to the climate and vegetation of the neighbourhood, its existence in these spots would soon have been followed by its increase; and the fact that it had not increased in places where he knew it occurred formerly was the best possible proof that something was wanting either in the climate or the vegetation. Nearly all the butterflies mentioned were very common, and not at all local, on the Continent. You found them everywhere there in places absolutely the most unlikely, under

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very different conditions, both of soil and climate, and in places, too, where the plants we considered necessary to them did not exist. He thought that was an additional proof that their disappearance was more or less a question of climate. When we came to the second head, how collectors were to be stopped, he did not think much could be done. Powers had been given to the County Councils to list certain birds during the breeding season, and prosecutions had been enforced for taking the nests of those birds. Only the other day, through the exertions of the Eastern Counties' Natural History Society, the foreshores all over the East Coast were declared prohibited grounds. He had given orders on his own land to the same effect, but with four hundred dredgers working there it was impossible to carry the orders out. He knew a gentleman who appointed an inspector to guard and watch in his district, and he succeeded for a little while. It was just the same with the Osprey in Scotland. As to stopping the schoolboy by a remonstrance to his master, he had not much faith in it. He believed two or three favourable seasons would do more to increase the numbers of a species than all the efforts of collectors did to decrease its numbers.

Mr. Crowley observed that in his own district he remembered, some forty years ago, *Vanessa polychloros* breeding in elm trees; but he had not seen it lately. *V. urticæ* and *V. io* were also much commoner formerly. He had not seen *Aporia crataegi* for thirty years. *Melitæa artemis* used to occur in one meadow near Alton, Hants. He used to find it freely twenty-five years ago, but he never found it now.

Mr. Goss said *M. artemis* was, to his knowledge, still abundant in some parts of Hampshire, Gloucestershire and Cumberland.

Mr. McLachlan observed that with regard to Mr. Elwes's remarks, he would point out that in a paper read by him some three or four years ago, he touched on all the points he raised. He quite agreed with him as to natural causes playing the greater part, but he thought that over-collecting might be "the last straw."

Mr. Tutt stated that *Apatura iris* used to be common at Chattenden, Kent, but it was now positively extinct. He had

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seen ten collectors (including two dealers) standing in a straight line in its restricted haunts, and the poor butterfly had certainly been over-collected. He thought one particular man practically extirpated *Melitæa athalia* at Chattenden. He remembered that a collector admitted taking 60 specimens of *Lycæna arion* in a year at Barnwell Wold, 50 the next year, and so on. The whole question was one for local Societies. If it was known that a species was being exterminated in a particular district the local Society could be asked to take some action in the matter. He thought the idea of making laws was absurd. The local Societies might easily take the subject in hand; but he did not think a resolution of any Society would have much effect on the greedy collector.

Walter F.H. Blandford, Esq., M.A., F.Z.S., Vice-President, then took the chair.

Mr. Blandford said he thought if the Society itself appointed a Committee, and the terms of the reference were as open as possible, that would meet the views of all.

Mr. Waterhouse expressed an opinion that the Meeting had no power under the Bye-Laws to appoint a Committee, but he considered that they should request the President to lay the matter before the Council, and ask them to appoint a Committee as soon as possible to investigate the matter.

Mr. McLachlan said he thought that was what was intended. He hoped some report of this discussion would get into the papers, and shame some of the would-be despoilers. Would it not be desirable to co-operate with other Societies for the preservation of plants?

Mr. Elwes said he thought that would probably be done. The Council could communicate with the Selborne Society and others of a like kind. He would move that a Committee be appointed with power to add to its numbers if thought necessary.

Mr. Blandford said that that was in the mind of the Council.

Mr. Goss asked Colonel Irby if he would state how and when *Lycæna arion* disappeared in Northamptonshire.

Colonel Irby stated that *L. arion* had disappeared many years ago not only from Barnwell Wold, Northamptonshire, but from another part of the county on the estate of Lord Lilford, not

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accessible to the public, and that its disappearance there was no doubt caused by the destruction of the food-plant and other herbage by burning the pasture, and by the grazing of sheep.

Mr. Tutt moved, and Mr. Elwes seconded, a resolution to the effect: "That the Council be requested to appoint a Committee (not necessarily restricted to Members of the Council or of the Society) to investigate the matter." The resolution was carried unanimously.

Papers read.

Mr. Guy A. K. Marshall communicated a paper entitled "Notes on Seasonal Dimorphism in South African Rhopalocera."

Mr. P. Cameron communicated a paper entitled "Descriptions of new species of Hymenoptera from the Oriental Region."

June 4, 1896.

Dr. David Sharp, M.A., F.R.S., Vice-President, in the Chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Exhibitions, etc.

Mr. Gervase F. Mathew exhibited the new species of Leucania, *L. flavicolor*, recently described by Mr. Barrett (Ent. Monthly Mag., 2nd series, vol. vii., p. 99), and also the varieties of *L. pallens* noticed by Mr. Barrett in the same article (*l. c.*, p. 100). He also exhibited a remarkable variety of *Mamestra abjecta*, which bore a close resemblance to *Apamæa gemina* var. *remissa* and to *Hadena genistæ*, and a bred specimen of *Eupithecia castigata* (?), with nearly the whole surface of the wings (the margins excepted) denuded of scales.

Mr. Elwes exhibited a collection of butterflies taken in the

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neighbourhood of Gibraltar during last April, and said that he had found the district very unproductive, owing to the great drought. Mr. J. J. Walker remarked that Mr. Elwes had been very unfortunate, as during three spring seasons his experience had been very different; at the same time it seemed to be agreed that Spain, as a whole, was not so rich in Lepidoptera as in other orders of insects.

Dr. Sharp exhibited on behalf of Mr. Hampson specimens of the female of *Oiketicus crameri*, recently sent by Mr. Dudgeon from Sikhim. The females in this species are so maggot-like that it is difficult to recognize them as perfect moths. There were also two pupa shells, one of which was used as a receptacle for eggs, and in the other eggs had hatched, so that it had the appearance of a pupa filled with young larvæ.

Mr. R. W. Lloyd exhibited a specimen of *Athous hæmorrhoidalis*, from Savernake Forest, Wilts., with a curious malformation of the right antenna.

Mr. Waterhouse exhibited several branches of oaks from the New Forest entirely denuded of foliage, and stated that throughout large tracts of the Forest the oaks had been stripped of their leaves in the same fashion by Lepidopterous larvæ, especially *Cheimatobia brumata*, *Hybernia defoliaria*, and *Tortrix viridana*. Certain trees, however, though situated among the denuded trees, had quite escaped. Dr. Sharp suggested that they belonged to a different species; but Mr. Waterhouse said that he had carefully examined them, and that this was not the case. Mr. McLachlan said that the immunity of the trees referred to was probably due to irregularity in coming into leaf. The discussion was continued by Mr. Elwes, Mr. Champion, Mr. Blandford, Mr. Jacoby, and others.

Mr. Tutt exhibited living pupæ of *Enodia hyperanthus* and *Epinephele ianira*, and pointed out how different the pupæ of these two species were in general appearance, structure, and cremastral attachment from each other. He pointed out that these two species had for a long time been erroneously placed in the same genus, but that, in all stages, they were widely separated, and that not only should they be placed in

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different genera, but that they appeared to belong to different tribes—*Enodia hyperanthus* being in the *Cœnonymphidi* and *Epinephele tanira* in the *Epinephelidi* (*vide* Entom. Record, vii., p. 301). He also exhibited living pupæ of *Thecla prunı* which had been sent to him by Mr. H. Mousley. He called attention to the great resemblance that the pupa bore, in its dorsal aspect, to a bird dropping. Black in ground colour, the two whitish prothoracic patches and the similarly coloured metathoracic patch which extend transversely across the constricted waist, give it a resemblance that cannot be misunderstood.

Mr. Blandford exhibited living specimens of *Callidium variabile*, L., bred from the bark of beech timber from Blenheim Park.

Mr. A. J. Chitty exhibited two specimens of *Osphya bipunctata*, F., which he had taken at Chattenden Roughs, and two species of *Psylliodes cyanoptera*, Ill., from Wicken.

Canon Fowler exhibited specimens of *Xyletinus ater*, Panz, taken by Dr. Chapman in Herefordshire; this was the first time this beetle had been recorded from this or the neighbouring counties.

Mr. Blandford exhibited and described series of Tropical American butterflies from the Godman-Salvin collection, arranged to show the existence and geographical distribution of homœochromatic groups.

Mr. Elwes characterised the exhibition as the most interesting that had been before the Society for many years, and hoped that the series would not be broken up, as was intended, until an opportunity had been found for full discussion of the various questions raised. The latter point was also urged by Dr. Sharp and Colonel Swinhoe, and at the conclusion of the meeting Mr. Blandford announced that Mr. Salvin had kindly consented that the series should be kept intact in order that it might form the subject of a special discussion later in the year, and that he himself would defer the publication of his remarks in view of the anticipated re-opening of the matter.

Mr. Tutt, having carefully examined the [illegible] of *Leucania flavicolor*, said that he considered it

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probable that it was a remarkable form of *Leucania pallens*, but that more material was required before a final opinion could be formed. The remarkable transverse (elbowed) line of dots crossing the forewings was exactly parallel with that of *Leucania straminea* and *L. impura* ab. *punctalinea*, and for an aberration of this character to occur in *L. pallens* was as probable as in *L. impura*, the typical form of which is but sparingly dotted in the direction of the elbowed line. The hindwings showed almost identical characters in the dark shading, traces of dots in nervures, &c., as the red aberrations of *L. pallens* exhibited by Mr. Mathew. He considered that until the matter of its specific distinctness was finally settled, Mr. Barrett had erred on the right side in giving it a distinctive name, even if the name subsequently fell as an aberration of *L. pallens*.

Paper read.

Dr. Chapman communicated a paper entitled "On the Phylogeny and Evolution of the Lepidoptera from a pupal and oval standpoint."

October 21st, 1896.

Professor Raphael Meldola, F.R.S., President, in the Chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Exhibitions, etc.

Mr. J. J. Walker, R.N., exhibited a specimen of *Emus hirtus*, L., taken at Gore Court Park, Sittingbourne, Kent, on the 30th May last.

Mr. W. B. Spence sent, from Florence, for exhibition, some specimens of a cricket, *Gryllus campestris*, in small wire cages, which he stated were, in accordance with an ancient custom, sold by the Italians on Ascension day.

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Mr. F. Enock exhibited a specimen of the curious aquatic Hymenopteron *Prestwichia aquatica*, ♀, which Sir John Lubbock first captured in 1862, but which had not been recorded since that date until its rediscovery in May, 1896. Mr. Enock said that the male had remained unknown until June last, when he captured several swimming about in a pond at Epping. The male was micropterous, and, like the female, used its legs for propelling itself through the water.

Mr. Tutt exhibited a beautiful aberration of *Tephrosia bistortata* (*crepuscularia*), in which the ochreous ground-colour was much intensified, and the transverse shade between the median and subterminal line was developed into a brown band; the transverse basal, median and subterminal lines on the forewings, and the median and subterminal lines on the hindwings, being strongly marked in dark brown. It was taken by Mr. J. Mason at Clevedon in March, 1893. Mr. Tutt further drew attention to the fact that it would be well if the Fellows of the Society would, in future, to clear up the confusion between this and the allied species, use the synonymy recently worked out at length by Mr. Prout. He had concluded that the double-brooded species, normally appearing in March and again in July, should be called *bistortata*, Goetze (= *biundulata*, Vill., *crepuscularia*, Dbldy., *laricaria*, Sta.), whilst the single-brooded species, appearing normally in May, should be called *crepuscularia*, Hb. This latter has for some time, in the magazines, been called *biundularia*, Esp. It is the *crepuscularia* of Stainton's Manual. He had no doubt whatever of the distinctness of the two species which Mr. Barrett would unite, and the difference of opinion at present existing was largely a matter of definition as to what constituted a species. Mr. Tutt also exhibited the cocoons, pupal-skin, and aberrations of the imago of *Zygæna exulans*. The cocoons were spun upon one another, five in a cluster, and Mr. Tutt stated that the species was exceedingly abundant in the pupal and imaginal stages during the first week of August on the mountain slopes above Le Lautaret, in the Dauphiné Alps, at from 7,000 to 9,000 feet elevation. The

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pupa-skin was very similar to those of other Zygænids. The imagines exhibited were all aberrations, and consisted of females of the ab. *flavilinea*, with bright yellow nervures; a large male and several females of the ab. *striata*, with the red spots more or less confluent and developed into streaks; also, an unique female aberration in which the wing, from the base to far beyond the centre was entirely crimson.

Mr. Warburg exhibited a long series, showing considerable variation in colour and curve of line, of what are considered on the Riviera to be typical *Bombyx quercûs* and ab. *spartii*, with a few preserved larvæ of each. According to Hübner, the insect he calls *spartii* differs from *quercûs* in being darker brown with a white dot instead of a lunule, and a narrower straighter band sharply defined outside in the ♂. The fringe of hair was in the male dark brown instead of yellow ochre. This description on the whole fits fairly with both the S. French (Cannes) varieties, which are differentiated by the colour of the larvæ, *spartii* being more fulvous than *quercûs*. According to Guenée this difference is constant, a point which he said he was hoping to ascertain soon. Guenée separates ♂♂ of *spartii* from *quercûs* by the following character, that *spartii* has the band of the forewing whiter in colour than that on the hindwing, a character which however appears to be present in Cannes *quercûs*. His specimens of both pupated about May, and emerged from 28th July, 1896, to end of October, ovipositing as soon as paired. Some ova were still unhatched and a few larvæ were already in their second skin. He also exhibited a series of Aberdeen *Bombyx callunæ* and some Swiss *B. quercûs*.

Dr. Sharp exhibited a specimen of a lepidopterous insect that had been alluded to in "The Entomologist's Monthly Magazine," Sept., 1896, p. 201. It was a caterpillar which had received the eggs of a parasite on the anterior part of the body; the abdomen, nevertheless, went on to the pupal metamorphosis, while the head and thorax remained attached to it in the caterpillar stage. He also called attention to some peculiarities in the pupa of *Plusia moneta*, pointed out to him by Mr. Fleet; in this species the pigmentation varies greatly in extent, and is sometimes entirely absent.

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Mr. Blandford called attention to the recent discoveries relating to the Tsetse fly, made by Surgeon-Major Bruce in Zululand, which proved that this insect affected animals by injecting them with a parasitic Protozoon. The parasite was communicated from wild animals to domestic animals, and was probably more widely distributed than was generally believed, it, or a closely allied form, having been found in India and England in sewer rats. He said that Surgeon-Major Bruce had proved that the Tsetse fly was pupiparous, which was of importance as affecting the classification of the Diptera. Dr. Sharp said that in his opinion the Tsetse fly would cease to be troublesome with the advance of civilization.

Mr. C. G. Barrett exhibited the pupa-skin, cocoon and eggs of *Hesperia comma*, L., found on chalk hills near Reading by Mr. A. H. Hamm. He also exhibited and remarked on a series of both forms of *Tephrosia crepuscularia* and *T. biundularia*, showing an unbroken line of variation from brown to white and also to grey and black. In addition, he showed several second-brood specimens of both forms obtained in the past summer by Mrs. Bazett of Reading. Mr. Tutt and Mr. Fenn made some remarks on the specimens exhibited.

Papers, etc., read.

Mr. Tutt read the following paper entitled "On the specific identity of *Cœnonympha iphis* and *C. satyrion*."

"In Staudinger's Catalog, p. 32, the author gives *satyrion*, Esp. (= *philea*, Hb.) as a variety of *Cœnonympha arcania*. He diagnoses it as 'var. alpina, minor, subt. fascia æquali alba, supra ♂ sæpius [♀ rarius] tota fusca.' He mentions as localities for it, 'Alps, Mountains of Central France.' Kane, in 'European Butterflies,' p. 133, follows Staudinger, and adds: 'It is a variable form, and often approaches *C. arcania* in more than one character.' This view has been repeated to me more than once in correspondence by collectors, who ought, at least, to have doubted that a species like *C. arcania* should have two so different Alpine forms as *darwiniana* and *satyrion*.

"In referring to Mr. Lemann's translation of Frey's

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'Butterflies of Europe,' p. 88, I was interested to see that that author did not agree with Staudinger's views. He treats *satyrion* as a distinct species, and remarks of its distribution in Switzerland: 'On all the Alps (from Wallis to the Tyrol) somewhat variable, but without passing into *C. arcania*. Commences to appear at about 4,000 feet. At 7,000 feet it begins to get scarcer in our fauna region, whilst 1,000 feet lower it often occurs very abundantly.' Rühl also adopts this view, and treats *satyrion* as a distinct species, whilst I recently observed that Dr. Jordan wrote many years ago (E. M. M., xvi., p. 89): 'It requires a great amount of faith to believe *C. satyrion* to be the same as *C. arcania*. At Heidelberg, *C. arcania* is most abundant and has exactly the same habits as *tithonus*, flitting about amongst the bushes and settling on the blossoms. *C. satyrion*, like *pamphilus*, is essentially a grass insect, and apparently very little subject to variation.'

"In the opinion that *C. satyrion* and *C. arcania* are distinct species, I quite concur, and would suggest that, with the exception of the white band bearing the ocellated spots on the underside of the hindwings, the two species have no other character in common.'

"Like most other lepidopterists, I have tried to unite *satyrion* with *arcania*. Like Frey I have failed, although the series of *C. arcania* var. *darwiniana*, which were captured on Monte Cristallo (Cortina), on August 8th, 1895, at an elevation of about 5,500 feet, by Dr. Chapman and myself, and which I now exhibit, shows some approach as a connecting medium, when compared with the typical *C. arcania* taken at Mendel Pass on July 31st, 1895, at rather less than 4,000 feet elevation. The approach is to *arcania* in the females, and to *satyrion* in the darkest males of the *darwiniana* group, which are becoming somewhat unicolorous; but I think you will agree with me that the superficial resemblance between these more unicolorous males of *darwiniana* and the brighter of the Lautaret males of *C. iphis* is actually greater than that between them and the especially bright males of *satyrion* from the Swiss Alps, which were sent to me by Prof. Blachier of Geneva. I have looked through the

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British Museum material (containing Zeller's and Frey's insects) and this helps me less even than the specimens I am exhibiting, to unite, even in the most superficial and artificial manner, *C. arcania* and *C. satyrion*.

"Although, as may be gathered from this, I consider *C. satyrion* specifically distinct from *C. arcania*, I am not at all certain that it is distinct from another European species. I have not seen it suggested before, but I believe that *C. satyrion* is a high Alpine form of *C. iphis*. The reason for this opinion is based on the remarkable variation exhibited by a series of insects, some two hundred in number, which exhibit both on the upper and undersides, and in both series, the most complete gradation between typical *satyrion* and *iphis;* in fact, extending somewhat beyond typical *iphis*, as exemplified in lowland districts, in the matter of suppression of ocellated spots on the underside, the range extending from specimens with no ocellated spots and scarcely a trace of the white band on the underside of the hindwings, to the strongly banded and fully ocellated examples which resemble typical *satyrion*.

"It may be well to see how the material exhibited would divide on the principle by which the species (?) are at present separated, viz., by calling those *satyrion* with a white band on the underside of the hindwings, and calling those *iphis* without this band. By this method Nos. 1, 2, and 10, 11 in Row 1 (males) would be *satyrion*, the remainder *iphis*. Nos. 1, 8 of Row 2 (females) would be *satyrion*, and the remainder *iphis*. Nos. 5, 6, 7, 8, 9 of Row 3 (males, undersides) would be *satyrion*, the remainder *iphis*. Of the female undersides (Row 4), Nos. 4, 6, 7, 8, 9 would be *satyrion*, the remainder *iphis*. I think you will all agree with me that such a subdivision of these specimens, which were all taken flying together on one grassy slope at Le Lautaret at an elevation of about 8,000 feet, would be somewhat absurd. When I further add that, under this arrangement, of two specimens taken *in copulâ* the male would go to *satyrion* and the female to *iphis*, I think you will agree that I have very good ground in supposing *satyrion* to be an Alpine form of *C. iphis* and not of *C. arcania*.

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"I find on searching through the works and figures of various authors that my views are largely upheld. An examination of Zeller's material in the British Museum collection has also proved interesting.

"Hübner's three figures of *C. iphis* are of importance as being the oldest figures of this species. Fig. 249 represents a male, of a rich dark brown colour and with no darker margin. There is a trace of one small ocellated spot near the anal angle of the hindwing, and no trace of the orange marginal line (or blotch) at the anal angle. Fig. 250 is a female and has the forewings of an ochreous hue with a darker shaded outer margin; the hindwings fuscous. There is an orange line edging the margin of all the wings; two small ocellated spots on the forewings and three on the hindwings. Fig. 251 represents an underside exactly intermediate between typical *iphis* and *satyrion*, inasmuch as the white transverse band on the underside of the hindwings is complete, but is just within, and does not contain, the series of ocellated spots which are otherwise conspicuous.

"Hübner's figures (254, 255) of *philea*, referred by Staudinger to *satyrion*, show distinctly the connection between *iphis* and *satyrion*. Fig. 254 is of the same colour as fig. 249 (*iphis*), but with a darker margin to the forewings made up of triangular interneural blotches having the bases on the margin of the wing. The hindwings are darker at the base, but there is a paler marginal band, in which a series of five dots can be seen, showing through, as it were, from the underside. An orange-red marginal line runs round the hindwings as in his fig. 250 (*iphis*). Fig. 255 represents the underside, and is of a very characteristic *iphis* appearance, as to colour and grey apex of forewings, but it has a very complete transverse whitish band on the hindwings, in which is the series of ocellated spots. It is very like the 9th specimen in Row 3, which, although banded, has particularly strong *iphis* characters.

"Esper's figure (Pl. 122, fig. 2) of *satyrion*, to
Staudinger refers as the type of the species, is abs
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There are traces of a hind marginal row of ocellated spots on the hindwings and an orange marginal line. The underside of the forewings is brown at the base with a broad yellow margin. The hindwings have a blackish base and yellow outer margin with six dots. It would appear that Charpentier, in 1836, wrote the letterpress to this figure,* and the description has been made quite independently of Esper's ridiculous figure.

"The series of *C. iphis* in the British Museum collection (called by the authorities *amyntas*) contains Zeller's specimens of this species. The males are all more fuliginous than the Lautaret specimens, the undersides are well ocellated and the hindwings show the white band in varying stages of development, but never quite continuous the whole length of the wing and never enclosing the ocellated spots. The females have the colour of the forewings above darker than have the specimens from Lautaret, and present no strikingly marked distinction in tint between the fore and hindwings as do those I exhibit, whilst all the females are more or less spotted on the upper side of the fore and hindwings. The two females that constitute the types of *mandane*, Kirby, are much more like the Lautaret females than any of the German and Swiss specimens, but one of the *mandane* has strongly ocellated hindwings on the upperside, like the German specimens. This character is quite absent in the Lautaret examples, as my specimens show.

"The female *C. satyrion* in the British Museum collection do not maintain altogether the distinction that I observe in the Lautaret examples, viz., the paler fore and the darker hindwings, the forewings being in some instances much duller than any I have taken. Other specimens have more ochreous forewings and then approach the Lautaret specimens more closely, but the latter, even in the most extreme forms, are evidently not quite so dark as those that occur elsewhere. The males in this series vary somewhat. Some have the forewings entirely fuliginous, others approach the orange-

* There is a footnote stating this fact in the British Museum copy of Esper's work.

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fulvous coloration of the more general form of *iphis* at Lautaret. The undersides have, without exception, the characteristic white band on the underside of the hindwings. Of course I am quite aware that a specimen without this band would be referred by continental entomologists elsewhere than to this species (*satyrion*).

"It may be well to compare Berce's description of *C. iphis* with that of *C. satyrion*, which he calls *philea*. These are to be found on pp. 218 and 219, and read as follows:

"*Iphis*. Wings of a clear brown, the superior having the disc tinted with tawny, without an apical ocellated spot. The inferior wings having often a short yellow line at anal angle. The underside of the superior wings tawny, with the apex and marginal border yellowish-grey. The inferior wings beneath of the same colour (yellowish-grey) with the median line, indicated by two irregular whitish spots, followed by a series of four to six ocellated spots circled with grey-white.

"♀. With the superior wings tawny and the inferior wings grey-brown, with an ante-marginal yellow line.

"*Philea* (= *satyrion*). Wings of a clear brown, the superior having the disc tinted with tawny, without an apical ocellated spot. The inferior wings with a yellow mark at the anal angle. The underside of the superior wings tawny with the apex greenish-grey. The inferior wings beneath of the same colour (greenish-grey), sometimes tinted with tawny, up to the median band. Then a yellowish-white band, broad and conspicuous, containing six ocellated spots. The outer margin reddish tawny, traversed by a leaden line.

"♀. With the superior wings tawny, bordered with grey-brown. The inferior wings grey-brown with an ante-marginal yellow line.

"In conclusion, it may be well to remark that one of the localities for *C. iphis*, mentioned by Berce, is Lautaret. There can be, therefore, no doubt but that my material agrees with that in the hands of continental entomologists. The exact similarity, in all essential points, of the above descriptions with the exception of the pale band present on the underside of *satyrion* and absent on the underside of *iphis*, is remarkable, and shows that, with the exception of this single unstable character, there is nothing, even in the continental descriptions of *iphis* and *satyrion*, to separate them."

The Rev. T. A. Marshall communicated a paper entitled "A Monograph of British Braconidæ. Part VII."

Mr. T. D. A. Cockerell communicated a paper entitled "New Hymenoptera from the Mesilla Valley, New Mexico."

Mr. E. Meyrick contributed a paper entitled "On Lepidoptera from the Malay Archipelago."

Dr. Sharp read a paper by Mr. G. D. Haviland and himself entitled "Termites in captivity in England."

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November 4th, 1896.

Professor RAPHAEL MELDOLA, F.R.S., President, in the Chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Exhibitions, etc.

Mr. McLachlan exhibited a collection of the cast nymph-skins of more than one-third of the species of European Dragon-flies from the Département de l'Indre, France, sent to him by Mons. René Martin. Two or three of the species had been reared in an aquarium, but the identification of most of them has been secured by finding the imago drying its wings in the immediate vicinity of the cast skin.

Mr. R. Adkin exhibited a long series of *Acidalia marginepunctata* taken on the sea-coast at Eastbourne, Sussex, during the past eight summers. The series included examples of a bone-coloured form with slightly indicated transverse markings; others much dusted with black scales giving them a deep grey tone, with well developed markings; and sundry forms intermediate between the two; also three taken this year, in which the whole of the wings, with the exception of a pale submarginal line, are densely covered with black scales, giving them a similar appearance to the so-called "black" forms that are found among some of the species of Boarmia and Tephrosia.

Mr. Horace St. John Donisthorpe exhibited a female specimen of *Dytiscus circumcinctus*, Ahr., with elytra resembling in form those of the male. He said the specimen had been taken in Wicken Fen in August last.

Mr. Tutt exhibited a specimen of *Mellinia* (*Xanthia*) *ocellaris*, captured by Mr. F. Whittle in September, 1894, and for comparison a specimen of *M. gilvago*, the latter species being common in the locality, and at the time that the specimen was captured. He referred to the fact that *M. ocellaris* was usually captured in the same localities as *M. gilvago*, and drew attention to the fact that Fuchs had considered them the same species. Fuchs' statement, as recorded in the

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"British Noctuæ and their Varieties," vol. iv., p.122, reads as follows:—"My own captured *gilvago* and *ocellaris* lead me to believe in the identity of these species, as I have one *gilvago* with the tips of the forewings acutely pointed, as in *ocellaris*. All my specimens, both of *gilvago* and *ocellaris*, have been taken in the noted poplar avenue of Hamburg, where *gilvago* is the rarer and *ocellaris* the commoner species. The freshly emerged specimens were taken on the trunks of poplars during the afternoon." Mr. Tutt said that, in his opinion, the species were abundantly distinct, but that *ocellaris* was yet so rare as a British insect that one wanted to see more specimens, and to know the life-history of the insect before one could object to Fuchs' conclusion. He also exhibited four specimens of *Argyresthia atmoriella* taken by Mr. Atmore last June at Lynn, Norfolk. He also exhibited a pupa-case of *Thymelicus lineola* from the Essex salt marshes. He drew attention to the structural characters exhibited by it, and pointed out that it differed markedly from the pupa of *Pamphila comma* exhibited at the last meeting. These structural differences led him to suggest that the separation of the old genus *Hesperia* (as still maintained by some British lepidopterists) into *Pamphila* and *Thymelicus* should be insisted upon. Mr. Tutt also exhibited a long series of a *Melampias* which he had captured at Le Lautaret in the Dauphiné Alps, at an elevation of 7,000—8,000 feet. He observed that the specimens exhibited were peculiar in some very important particulars. The males varied somewhat in size and in the shape of the wings, and the females showed a marked sexual dimorphism. Typically, *M. melampus* was looked upon as a somewhat round-winged species, with black dots in the fulvous band and spots of the fore and hindwings, the females very closely resembling the males, but having somewhat paler fulvous (almost orange) markings and spots beneath. *M. pharte*, on the other hand, was considered to be a longer-winged insect, without black dots in the fulvous bands and spots on the fore and hindwings respectively, whilst the female is characterised by its pale orange (instead of fulvous) bands and spots, both on the upper and undersides, thus making a marked sexual dimorphism. Further, *M. melampus* was generally considered to

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occur at a lower altitude than *M. pharte*. He himself had found *M. melampus* abundantly in various localities, at from 3,500—4,500 feet, in Piedmont, the Tyrol, etc.; but *M. pharte* occurred rather from 5,000—7,000 feet. Mr. Tutt said that his attention was first drawn to the species by some very fine examples captured at about 4,500 feet elevation, on Mont de la Saxe (Courmayeur), on Aug. 1st, 1895, by Dr. Chapman and himself. It was suggested to him that these specimens were *Erebia eriphyle*, but he was of opinion (and this opinion was shared by Mr. Elwes) that the specimens represented *melampus*. Compared, however, with Tyrolean (Campiglio, Mendel) examples of the latter, these exhibited a tendency to a lengthening of the forewings and to an obsolescence of the black dots, thus coming in these particulars somewhat near *pharte;* but the females were very like the males, and presented none of the typical characters of female *pharte*. These specimens were exhibited. Returning to the Lautaret captures, which were all taken together, flying in the same field (some *in copulâ*), it will be observed, from the specimens exhibited, that the males run from typical *melampus*, with four or five black dots in the fulvous band, through specimens with 3, 2, 1, and no black dots, *i.e.*, to typical male *pharte*. The shape of the wings, too, varies from the typical rounded-winged *melampus* to the more pointed-winged *pharte*, some of the specimens which are *pharte*, so far as their unspotted band goes, being *melampus* by the rounded character of the apices of the forewings. The females are all typical *pharte*, with a band more orange than fulvous, and with the band distinctly pale, as in *pharte*, on the underside. It would appear that here (Lautaret) *melampus* and *pharte* form but one species, however distinct they may be in some districts. Of course it would be easy to separate the spotted forms from the unspotted forms, and call the former *melampus* and the latter *pharte*, but it would not get over the difficulty of the females being all of one form, nor of the fact that a proportion of the *melampus*-shaped males are unspotted, and *vice versa*, nor of the fact that some of the males which are typical *melampus* were paired with typical female *pharte*. The species were not uncommon in the flowery meadows, but

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rather *passé*. Mr. Nicholson, to whom I have submitted the specimens, writes: "I believe all these specimens to be *melampus*. The round-winged specimens are very like my Swiss ones. *Melampus* is hard to define as a species." If Mr. Nicholson's views were to be accepted, it would create a difficulty, for he observed of Hübner's figs. 491—494, from which the species *pharte* is named, "Hübner's figs. 491 and 492 are identical with the Lautaret females, whilst his figs. 493 and 494 are identical with most of the unspotted males, only Hübner, strangely enough, whilst showing the colour dimorphism that exists between the sexes, has transposed the bodies, so that figs. 491 and 492 have ♀ coloration and ♂ body, whilst figs. 493 and 494 have ♂ coloration and ♀ body." (Ent. Rec., viii., pp. 258 & 259.) To illustrate his views more clearly he also exhibited some typical specimens of *M. pharte* from the Swiss Alps, captured by Professor Blachier of Geneva, July 10th, 1885. It will be observed that these females are absolutely identical in tint, bands, and spotting, with the Lautaret females, and that if the Swiss specimens are *pharte*, then the Lautaret specimens certainly are. Berce (p. 188) makes the following suggestive observation about *M. pharte*: "A little larger than *melampus*, from which it differs in that the ferruginous blotches are altogether devoid of black points, those of the superior wings more rectangular, those of the inferior wings a little oval. It has the same habits as *melampus*, and is found at the same time, and in the same localities." This would suggest that Berce knew of the two so-called species overlapping, but that it did not occur to him that they really formed but one species. I do not doubt that in many localities both *melampus* and *pharte* have specific value. Here, at Lautaret, undoubtedly the species are (or is) in a state of flux, and, like *Cœnonympha iphis* and *C. satyrion*, not specifically differentiated. Mr. Tutt said he would explain these peculiar facts much in the same way that he had already attempted to explain the parallel case of mixing of *Cœnonympha satyrion* and *C. iphis*. The altitude at which the insects are found at Le Lautaret tends to produce the Alpine forms *satyrion* and *pharte*; whilst the marvellously

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luxuriant pasturages in which they occur (in August, there is, I believe, nothing to equal these in Europe at the same altitude), the peculiar position of this high lying Lautaret basin (described Ent. Rec. viii., p. 253), and its high summer temperature (for the altitude), all combine to produce an environment, characteristic of an elevation of 2,000—4,000 feet, rather than of 7,000—8,000 feet, and, as a result, we find the attempt to produce the form usually found at a higher, and that usually produced at a lower, altitude, crowned with a certain amount of success. Mr. Tutt said that, of course, he knew that *melampus* and *pharte* do not normally represent such distinctly low altitude and high altitude forms as *iphis* and *satyrion* respectively. Two remarks of Frey ("Butterflies of Switzerland") deserved notice. The first is that the female of *melampus* "is only rarely taken." Is this because the females in the districts known to him would have been referred to *pharte*. The second is to the effect that *pharte* is "widely distributed in damp spots within the tree line (4,000—6,000 feet)," a description which would apply to every place (except the Lautaret locality) in which he (Mr. Tutt) had taken *melampus*.

Mr. Elwes observed that though all the continental butterflies had been so long studied by European entomologists, he did not think the form exhibited by Mr. Tutt had been hitherto noticed. He considered that Mr. Tutt had made out his case, and he agreed in the conclusions at which he had arrived. Mr. McLachlan, Mr. Jacoby, and Professor Meldola continued the discussion.

Mr. E. Ernest Green exhibited a typical specimen of *Ephyra omicronaria*, together with what he believed to be a remarkable melanic variety of the same species, taken by Dr. Dudley Wright at Pegwell Bay, near Ramsgate, in September last. Some of the Fellows present, after an examination of the specimen, expressed an opinion that it was a variety of an Acidalia, and not of *Ephyra omicronaria*.

Mr. Goss stated that Mr. Harry Fisher, the botanist to the Jackson-Harmsworth expedition, had returned to England. He hoped that he would have been present at the meeting to exhibit a few minute Diptera and other insects which he had collected in Franz Josef Land. Mr. McLachlan made some

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remarks on insects and flowers in high latitudes, and Mr. Elwes, Sir George Hampson, and Professor Meldola also commented on the subject.

November 18th, 1896.

Professor Raphael Meldola, F.R.S., President, in the Chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Election of Fellows.

Mr. Malcolm Burr, of "Bellagio," East Grinstead, Sussex; Mr. G. H. Gale, of the Public Works Department, Hong-kong; and Mr. A. E. Wileman, of the British Consular Service, Yokohama, Japan, were elected Fellows of the Society.

Exhibitions, etc.

Mr. Tutt exhibited a series of the ochreous form of *Tephrosia bistortata*, Goetze, known as var. *abietaria*, Haw., captured by Mr. J. Mason in March, 1895 and 1896, near Clevedon, Somerset; also a specimen of the black-brown ab. *passetii*, Thierry-Mieg, captured by Major Robertson, at Swansea in March, 1895; also a series of the second brood = var. gen. 2, *consonaria*, St., of the same species bred June 16-23rd, 1896, from ova laid by the March Clevedon examples. The small size and dead-white ground-colour is very remarkable in these specimens; a specimen of the second brood bred from Ramnor, July, 1889, is put in for comparison, as this, although of the same small size, shows the ochreous hue of the spring (*abietaria*) form. He also exhibited a series of *Tephrosia crepuscularia*, Hb. (*biundularia*, Esp.), from Doncaster, captured by Dr. H. H. Corbett, all from one wood. These were captured in May, 1893-95, and exhibited every grade of variation from the most typical *crepuscularia*, Hb., to extreme forms of *delamerensis*, B. White. Mr. Tutt said

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that he would especially draw attention to the difference existing between the white *crepuscularia*, Hb., and the second brood of *bistortata* var. *consonaria*. It has been asserted that "the second brood of *bistortata* is typical *biundularia*." This it would be seen is not so, although there is considerable superficial resemblance between them. The question as to these being two or one species turned on two points. If it be admitted that the same species may comprise two forms, (1) with distinct facies, (2) with distinct life-cycles, then it must be admitted these may be the same species; but if on the other hand it be granted, that (1) different facies and (2) distinct life-cycles be sufficient to constitute species, then these must be considered distinct species. The two species have very similar environments, and exhibit a parallelism of variation, but he did not think that parallel variation proved specific identity in confessedly closely allied species. He also exhibited a specimen of *Hipparchia semele*, captured by Mr. H. Shortridge Clarke, on the "Mooragh," near Ramsey, Isle of Man, July 12th, 1896; the specimen exhibited the usual small size and bright fulvous coloration of the Isle of Man forms, but had an extra ocellated spot in the third interneural space below the normal apical one. He also exhibited an aberration of *Amphidasys betularia* caught in the "Nunnery grounds" near Douglas, July, 1896, the specimen being remarkable in having a white ground-colour without the usual black freckling which has earned for the species the name of the "Peppered Moth;" the type occurs in the island. He also exhibited a richly marked specimen of *Abraxas grossulariata*, caught in "The Curraghs," Ballaugh, July 16th, 1896, which had especially well developed orange markings; and also a series of *Plusia bractea* bred from ova laid by a female in July last. The eggs and larvæ were subjected to forcing treatment from the first by Mr. Finlay of Morpeth, who obtained the eggs, with the result that the whole batch produced moths in October. The larvæ were fed on that variety of dandelion grown for salad purposes. One specimen was remarkable in having at the base of the metallic spot on the right forewing a small additional metallic spot. A very dark specimen of *Polia chi* ab. *olivacea* was also

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shown, the green ground-colour being especially well developed. This also was captured at Meldon Park, Morpeth, by Mr. Finlay. Mr. Tutt further exhibited eggs of *Ennomos autumnaria* (*alniaria*), showing the regularity with which the rows are placed one inside the other; specimens of *Orrhodia vaccinii* ab. *obscura*, showing parallel variation and considerable superficial resemblance to *O. erythrocephala* ab. *glabra*, captured by Dr. Riding, near Honiton, Devon; also some specimens of *O. vaccinii*, showing an intermediate stage between the type and aberration; also cases of an Australian Psychid *Liothula omnivora*, Fereday, sent over by Mr. W. W. Smith, of Ashburton, New Zealand. Mr. Tutt said that it would be remembered that he exhibited, some twelve months ago, a number of cases of *Thyridopteryx ephemeræformis*, or a species allied thereto, and gave figures of the same in Ent. Rec., vol. vii., with notes. Mr. Smith thought that the "Basket Caterpillar of New Zealand" might prove equally interesting.

Dr. Sharp called attention to Mr. Ernest Green's plates of the *Coccidæ* of Ceylon, which were exhibited on a screen in the room, and said that he was inclined to consider the *Coccidæ* as a distinct order of insects, but at present the evidence was hardly sufficient to warrant this. He asked Mr. Green if he could give him any information with regard to the development of the wings in the male.

Mr. Green said that in the males of the *Coccidæ* the wings first appeared in the penultimate stage as small projections on the sides of the thorax. These wing-pads grew to a certain extent without any further ecdysis. Though the insect was then quite inactive, and took no food during this stage, the rudimentary wings and legs were free from the body, and were capable of some slight movement. After the final ecdysis the wings of the imago were fully expanded, and assumed their natural position before the insect left the sac, or puparium, in which the resting stage had been passed. Mr. McLachlan and others continued the discussion.

Mr. Bethune-Baker exhibited a yellow spider from Orotava, which was of the exact colour of the flowers that it usually rested upon, and which had been observed to catch

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Vanessæ which settled on these flowers. Mr. Barrett said he had noticed a spider with the same habit on the Ox-Eye Daisy in Surrey. Mr. Bethune-Baker also exhibited a very curious dark variety of *Arctia caja*, bred by Mr. Moore.

Professor Meldola stated that it had been of late found difficult to store bristles in the City owing to the ravages of a moth, of which he exhibited living specimens of the larvæ and pupæ. Mr. Barrett said that the moth was *Tinea biselliella*. Mr. Blandford stated that the bisulphide of carbon treatment might be found to be of advantage if it were practicable, but more would have to be ascertained with regard to the extent and character of the ravages before anything could be determined upon. Mr. Merrifield, Mr. Green, and others took part in the discussion which followed.

Mr. Blandford called attention to the use of formalin as a preventive of mould, and said that it would probably be found of use in insect collections; an object once sprayed with this substance never became mouldy afterwards. Professor Meldola said that formalin was another name for a solution of formic aldehyde: it is now much used in the colour industry and is, therefore, produced on a large scale.

Paper Read.

Mr. Newstead communicated a paper entitled "New *Coccidæ* collected by the Rev. A. E. Eaton in Algeria."

December 2nd, 1896.

Dr. David Sharp, M.A., F.R.S., Vice-President, in the Chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Exhibitions, etc.

Dr. Sharp exhibited the series of Longicorn Coleoptera of the genus *Plagithmysus* from the Hawaiian Islands, of which a preliminary account had recently been given by him elsewhere. He said that these examples were the result of Mr. Perkins' work for the Sandwich Island Committee, and

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afforded a fair sample of his success in the other orders, which would be found to have completely revolutionised our knowledge of the entomological fauna of these islands. He stated that Mr. Meyrick had recently informed him that the *Geometridæ* would be increased from six species to forty-four, and that the genus *Plagithmysus* showed an almost equal increase; and that the working out of the specimens was very difficult, owing to the variability of the species and to their being closely allied.

Mr. Malcolm Burr exhibited a specimen of a cockroach, *Pycnocelus indicus*, Fabr., taken in a house at Bognor, Sussex. He said this was the first record of the occurrence of the species in England. According to De Saussure, it was distributed throughout India, Ceylon, Mexico, and the United States.

Mr. P. Crowley exhibited a remarkable variety of *Abraxas grossulariata* taken in a garden at Croydon last summer.

Mr. Tutt exhibited some Micro-Lepidoptera from the Dauphiné Alps. Among them were several specimens of *Psecadia pusiella*, Röm., showing considerable difference in the width of the black zigzag band crossing the centre of the forewings longitudinally. The species was taken at La Grave, in a gully at the back of the village. A large number of specimens was secured, chiefly resting on the trunks and branches of two or three ash and willow trees growing on the bank at the side of the gully. A few specimens, however, were obtained drying their wings on the grass on the bank, but Mr. Tutt stated that he failed to find pupa-cases. The captures were all made on the mornings of August 7th and 8th. In spite of the striking conspicuousness of the insect when set out for the cabinet, it was by no means easy to detect at first on the tree trunks, as it sat with its wings overlapping, in the cracks and crannies of the bark. Mr. Tutt also exhibited specimens of a "plume" which had been named *Leioptilus* (*Alucita*) *scarodactyla*. It was exceedingly abundant on the *Artemisia* growing on the roadside just below La Grave. There could be little doubt, he thought, from the habits of the insect, that the *Artemisia* had been its food-plant. He also exhibited specimens, from Le Lautaret, of *Sericoris rivulania*, *Gelechia*

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spuriella, *Sophronia semicostella*, *Pleurota pyropella*, *Œcophora stipella*, and *Butalis fallacella*. The latter were chiefly interesting from the fact that they were taken at an elevation of about 8,000 feet Lord Walsingham said that these Micro-Lepidoptera from the Dauphiné Alps were exceedingly interesting, and resembled those obtained by M. Millière in a more southern latitude. The "plumes" were particularly interesting, and he had been much puzzled over some species which Mr. Tutt had sent him, one of which he considered was a strange form of *Oxyptilus hieracii*. He also remarked on the close resemblance between certain American and European species of plumes.

Paper read.

Lord Walsingham read a paper entitled, "Western Equatorial African Micro-Lepidoptera." A discussion ensued, in which Dr. Sharp, Mr. Jacoby, and others, took part.

ANNUAL MEETING.

January 20th, 1897.

Professor Raphael Meldola, F.R.S., President, in the Chair.

Mr. Albert Hugh Jones, one of the Auditors, read the Treasurer's Balance Sheet, showing a balance of £10 8s. 2d. in the Society's favour.

Mr. H. Goss, one of the Secretaries, read the following

Report of the Council.

During the Session 1896–97 five Ordinary Fellows have died, *viz.*, Mr. Edward Armitage, R.A , Mr. Peter Inchbald, F.L.S., Miss Georgiana E. Ormerod, Mons. Auguste Sallé, and Mr. Arthur Dowsett; eleven Fellows have resigned, and thirteen Ordinary Fellows have been elected.

The number of Fellows elected during the year is far below the average, notwithstanding the successful efforts of one or two Fellows of the Society to add to its numbers.

At the present time the Society consists of 10 Honorary, 55 Life, and 319 Fellows liable for the Annual Subscription,

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leaving the total number now on the list 384, or three less than this time last year!

Our Transactions for the year form a volume of 594 pages, containing 16 Memoirs, contributed by the following authors, *viz.*, Mr. George C. Champion (2 papers); Mr. Kenneth J. Morton; Dr. Frederick A. Dixey; Dr. David Sharp, F.R.S.; Mr. George F. Scott-Elliott; Dr. T. Algernon Chapman (2 papers); Mons. Louis Péringuey; Mr. Walter F. H. Blandford; Mr. E. Ernest Green; Prof. Edward B. Poulton, F.R.S.; Prof. Samuel Williston and Prof. J. M. Aldrich; Sir George F. Hampson, Bart.; Mr. Guy A. K. Marshall; and Mr. George D. Haviland and Dr. D. Sharp.

Of these 16 papers, 5 relate to Lepidoptera, or to enquiries in which they were the subjects of experiment; 5 to Coleoptera, 2 to Neuroptera, 2 to Orthoptera, and 2 to Diptera.

Part of the cost of the publication of the longest of the two papers on Diptera was defrayed by the Royal Society, who contributed a donation of £50 from their Publication Fund.

The Memoirs above referred to are illustrated by 14 plates, of which 4 are coloured.

The Proceedings, containing an account of the Exhibitions and Discussions at the Meetings, in addition to certain Papers not published in the Transactions and to several Notes of interest in connection with Exhibitions, extend to over 58 pages.

During the past year, 195 Books (in addition to the usual Transactions, Pamphlets, and Papers) have been added to the Library, which is increasingly used, no less than 335 volumes having been borrowed during the year by Fellows. The Meetings continue to be, as they have been of recent years, far better attended than formerly. As pointed out last year, there is probably no Society in London with a similar number of Fellows on its list which has such a proportionately large attendance, the Meetings of this Society comparing very favourably in this respect with those of other kindred Societies.

The amount received for current Subscriptions is in excess of that in any former year. The arrears paid up during 1896 have exceeded anticipations. There is a large falling off in Admission Fees consequent on a diminished number of new Fellows having been elected. The Donations are small, if the amount received from the Publication Fund of

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the Royal Society, already alluded to, be deducted. The income derived from the Sales of Publications during the year is nearly the same as in 1895, and below the average. Three Life Compositions have been received, two of which have been invested in Consols, the amount so invested being now £534 13s.

The disbursements for Printing and Plates have been exceptionally heavy, but there is again a diminution in the total of the various items classed under Office Expenses. The actual financial working of the year results in a balance to the credit of the Society of £10 8s. 2d.; but against this must be placed the uninvested Life Composition and a small sum due to printers on an unadjusted account, so that there is really a deficit on the year, due to the printers having very largely underestimated the cost of two expensive papers.

11, Chandos Street, Cavendish Square, W.
20th January, 1897.

The Secretaries not having received any notice proposing to substitute other names than those contained in the lists prepared by the Council, the following Fellows constitute the Council for 1897:—Walter F. H. Blandford, M.A., F.Z.S.; George C. Champion, F.Z.S.; The Rev. Canon Fowler, M.A., F.L.S.; Herbert Goss, F.L.S.; Sir George Francis Hampson, Bart., B.A.; Martin Jacoby; Robert McLachlan, F.R.S.; Prof. Raphael Meldola, F.R.S.; Frederic Merrifield; Osbert Salvin, M.A., F.R.S.; Roland Trimen, F.R.S.; James W. Tutt; and George Henry Verrall.

The following are the Officers elected:—*President*, Mr. Roland Trimen; *Treasurer*, Mr. Robert McLachlan; *Secretaries*, Mr. Walter F. H. Blandford and Mr. Frederic Merrifield; *Librarian*, Mr. George C. Champion.

Professor Meldola, the out-going President, then delivered an Address, at the conclusion of which Lord Walsingham proposed a vote of thanks to the President for his Address, and for his services as President during the year. This was seconded by Mr. O. Salvin, and carried.

A vote of thanks to the Treasurer, Secretaries, and Librarian, was proposed by Professor Poulton. This was seconded by Mr. R. Trimen, and carried.

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ENTOMOLOGICAL SOCIETY OF LONDON.

Balance Sheet for the Year 1896.

Receipts.	£	s.	d.
Balance in hand, 1st Jan., 1896	12	14	7
Subscriptions for 1896	313	19	0
Arrears	18	18	0
Admission Fees	25	4	0
Donations	7	19	0
Grant from Publication Fund of Royal Society	50	0	0
Sales of Transactions, &c.	61	10	0
Interest on Investments :—			
Consols £213 13 5			
Westwood Bequest 6 19 0			
	20	12	5
Life-Compositions	47	5	0
Subscriptions in advance	7	18	7
	£566	0	7

Payments.	£	s.	d.
Printing Transactions, &c.	253	14	11
Plates, &c.	82	0	8
Rent and Office Expenses	160	12	3
Books and Binding	19	16	0
Investments in Consols	31	10	0
Subscriptions in advance carried to 1897	7	18	7
Balance	10	8	2
	£566	0	7

ASSETS.

Subscriptions in arrear considered good (say) £15 15*s.* 0*d.*

Investments :—

Cost of £546 3*s.* 8*d.* Consols ... £534 13*s.* 0*d.*

Cost of £239 12*s.* 4*d.* Birmingham Corporation 3 per cent. Stock (Westwood Bequest) £250.

Robert McLachlan,
Treasurer.

Audited and found correct,

Samuel Stevens.
G. F. Hampson.
R. Wylie Lloyd.
A. Hugh Jones.

13th January, 1897.

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THE PRESIDENT'S ADDRESS.

GENTLEMEN,

The affairs of the Society, as set forth in the Council Report, call for no special comment from the presidential chair. You will hear with satisfaction that we have been included among those Societies which are entitled to send up applications to the Scientific Relief Committee of the Royal Society, a concession which we must acknowledge to be a recognition of the status which our Society has reached in the scientific world. During the past year we have also, at the instigation of our Treasurer, taken action with respect to the over-collecting of British insects, and a Committee has been formed, with Mr. Barrett for Secretary, for dealing with this subject. Having myself long ago come to the conclusion that there was a real cause of alarm, so far as concerns the rare and local species of this country, it is with great interest that I have taken part in the work of the Committee. As yet two meetings only have been held, and it has become evident that the task of dealing with the matter in a practical way will be a very difficult one. It is encouraging to learn, however, that the mere announcement that our Society had taken up the subject has given general satisfaction throughout the country, and we have received promises of support and co-operation from several local societies as well as from individuals. Whether any feasible scheme of protection can be devised, and, if so, can be put into operation, must be left for decision by the Committee at future deliberations. In the meantime the moral influence of the movement cannot but make itself felt.

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One memorable incident that has occurred during the past year has been the visit of the Officers and Council of the Society to Oxford at the invitation of the Hope Professor of Zoology. It gives me great pleasure to acknowledge the kindness with which we were received by all Members of the University with whom we came into contact. The Vice-Chancellor was only prevented by another pressing engagement from participating personally in our reception, but he showed his appreciation of our visit by extending the hospitality of his house to your President. The various specialists among our Councillors who were present on this occasion must have noted with satisfaction the improvement in accommodation and the great progress that has been effected in the arrangement of the collections since Prof. Poulton came into office. If, as my friend the Hope Professor intimates, this visitation is to become an annual institution, I can only rejoice that a movement calculated to be of great benefit to our Society, as well as to the Hope Museum, should have been inaugurated during my occupancy of this chair.

Many papers, both of general and of special importance, have appeared in our 1896 volume of "Transactions." I may mention, among the subjects of particular interest to myself, the very valuable contribution to the theory of the development of mimetic pattern by Dr. Dixey, Prof. Poulton's observations on the courtship of *Acrididæ*, and Dr. Chapman's papers on Lepidopterous pupæ. One very lengthy systematic paper on the Diptera of St. Vincent, by Profs. Williston and Aldrich, communicated by Dr. Sharp, occupies practically the whole of Part III., and would, I am afraid, have been beyond our resources had we not received a grant from the Royal Society for defraying the cost of its publication.

In resigning the honourable duties which I have been called upon to discharge during the last two years, I cannot but feel how largely I am indebted to the Officers who so ungrudgingly devote their time to the interests of the Society. It is with considerable regret that we must accept the simultaneous withdrawal of both Secretaries. These gentlemen have served

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us long and well. Mr. Goss has for a period of eleven years undertaken the larger share of those duties which, as I can testify from personal experience, are by no means light to a professional man having many other occupations; he has certainly earned his retirement, and with it the gratitude of the Society. To Canon Fowler are we no less indebted when we bear in mind the distance at which he resides from London, and the numerous other claims upon his time. It must temper our regret at the loss of these gentlemen, however, to know that we have been so fortunate as to secure the services of Mr. Blandford and Mr. Merrifield, in whose hands we may feel assured the scientific status of the Entomological Society of London will be well maintained. With regard to my own position I can only feel that I have been a usurper in the chair which should have long ago been occupied by the distinguished entomologist who succeeds me. It is only due to the circumstance that Mr. Trimen has for so many years been in charge of the South African Museum that we have never before had the opportunity of seeing him in that position which is his due. Our new President has for thirty-eight years been a Member and Fellow of the Society; he has won his spurs, not only as an entomologist, but as an all-round naturalist, and it is to me a matter of congratulation that I have this evening the privilege of handing over to him the reins of office.

THE UTILITY OF SPECIFIC CHARACTERS AND PHYSIOLOGICAL CORRELATION.

Among the subjects of general biological interest which have been discussed during the past year, I have selected as the theme of my address one which was introduced by our eminent colleague, Dr. A. R. Wallace, at a meeting of the Linnean Society held on June 18th. The importance of this paper is due not only to the circumstance that it was read in person by its veteran author, but also to the fact that, after the lapse of thirty-eight years, the principles of the theory of natural selection, as a theory competent to explain the formation of species, have been reaffirmed with renewed

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emphasis by one of the founders of the doctrine. All who have concerned themselves with the species question are aware that the validity of natural selection as an efficient cause has now reached a stage in which opinions are divided between two extremes. Some naturalists regard this agency as the sole and all-sufficient cause of species transformation, while others recognize in natural selection only a feeble or quite unimportant factor. A few, but not many, reject natural selection altogether. The majority of biologists in this country, perhaps, hold an intermediate position, recognising the importance of natural selection but unconvinced as to the residuary phenomena.* The discussions which have

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* It is surprising to find that Signor Todaro, in a recent address to the *Reale Accademia dei Lincei*, of which an abstract appears in "Nature" (Dec. 10th, 1896, p. 138), should have said that "Natural selection, which tried to explain everything, has had its day, and now is only invoked to account for certain secondary characteristics, or those attributed to the adaptations of individual forms." The context, if correctly representing the speaker's views, shows not only that he has completely failed to grasp the principles of the theory, but also that he is unaware of the state of current biological thought in this country.

It is notorious that this same complaint of being misunderstood was frequently made by Darwin after the publication of the "Origin of Species." In this connection the following unpublished letter, unfortunately undated, addressed to the late Prof. D. T. Ansted, F.R.S., and now in the possession of my father-in-law, Dr. Maurice Davis, will be of interest:—

"15, MARINE PARADE, EASTBOURNE,
"Oct. 27.

"MY DEAR ANSTED,

"As I am away from home on account of my daughter's health, I do not know your address, and fly this at random, and it is of very little consequence if it never reaches you.

"I have just been reading the greater part of your 'Geological Gossip,' and have found part very interesting; but I want to express my admiration at the clear and correct manner in which you have given a sketch of natural selection. You will think this very slight praise; but I declare that the majority of readers seem utterly incapable of comprehending my long argument. Some of the reviewers, who have servilely stuck to my illustrations and almost to my words, have been correct, but extraordinarily few others have succeeded. I can see plainly, by your new illustrations and manner and order of putting the case, that you thoroughly comprehend the subject. I assure you this is most gratifying to me, and it is the sole way in which the public can be indoctrinated. I am often in despair in making the generality of *naturalists* even comprehend me. Intelligent men who are not naturalists and have not a bigoted idea of the term species, show more clearness of mind. I think that you have done the subject a real service, and I sincerely thank

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arisen of late years appear to me to turn rather upon the degree of efficiency which can be assigned to the process.

It is not my intention to enter now into the question as to what Mr. Darwin meant by this or that passage in his writings; neither am I about to take upon myself the responsibility of claiming to be among his infallible interpreters. I am simply a disciple of nearly a quarter of a century's standing of the doctrine formulated by him and by Wallace. If, with the progress of discovery and the advancement of knowledge, new considerations have arisen in the course of time which are not to be found within the two covers of the "Origin of Species," or any other of Mr. Darwin's books, then, from what I knew of Mr. Darwin himself, I am bound to say that it is doing an injustice to the scientific spirit of our great leader if we allow that the acceptance of any extension or completion of his work justifies our being branded with a denominational epithet, as though we had founded a new sect.* We either accept the theory as Darwin left it, after making use of all the knowledge available at his time viz., that natural selection is the main but not the exclusive means of the modification of species, or we may, following Weismann and Wallace, reject the factor of use-inheritance, and so give more weight to natural selection as a prime factor. The only really important modification of the theory since Darwin's time, is this elimination of the remnant of Lamarck-

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you. No doubt there will be much error found in my book, but I have great confidence that the main view will be, in time, found correct; for I find, without exception, that those naturalists who went at first one inch with me now go a foot or yard with me.

"This note obviously requires no answer.

"Pray believe me,

"Yours sincerely,

"C. DARWIN."

My friend, Mr. Francis Darwin, who has sanctioned the publication of this letter, informs me that it must have been written in 1860.

* I have in my mind, among many similar instances of Darwin's scientific candour, the readiness with which he accepted Fleeming Jenkin's criticism as to the improbability of single varieties gaining a footing, owing to the "swamping effects" of intercrossing. This point is well brought out in Poulton's recent work on "Charles Darwin and the Theory of Natural Selection" (p. 81; also the "Life and Letters," Vol. III., p. 107).

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ism which lingers under such an expression as "use-inheritance," or Buffon's factor of the "direct action of the environment." On this point I venture to think that the general tendency of work and thought in this country has been to strengthen the contention of Prichard,* Galton, and Weismann, that acquired characters are not transmitted. It is true that many naturalists, whose opinions are entitled to the greatest weight, and more particularly a certain school of American biologists, are not prepared to accept this doctrine. While admitting that there are difficulties which require further elucidation, it still appears to me that the balance of evidence is in favour of this amendment of the theory. Certainly the transmission of acquired characters cannot be regarded as a general law of nature, in view of the vague conclusions which have resulted from all attempts at the verification of this doctrine by observation or experiment. It is satisfactory to know that the surviving founder of the theory of natural selection, Dr. A. R. Wallace, has fully accepted the Weismannian modification.

The present position of biological theory, apart from any working hypothesis as to the mechanism of heredity, the struggle of parts within the organism, germinal selection, etc., may thus be summed up in the statement that while the broad principle of evolution is on all hands admitted, there are differences of opinion as to the process or processes by which species and (by implication) the higher taxonomic divisions have been produced. But these differences of opinion ultimately resolve themselves into the acceptance or rejection of the special method of evolution which is associated with the names of Darwin and Wallace, because, as far as I have been able to follow the course of post-Darwinian biological speculation, I cannot come to any other conclusion than that beside the theory of natural selection there is no rival doctrine of organic development which will bear analysis in the light of reason and of fact. Of course it is quite legitimate for any naturalist to deny the adequacy of natural selection as the

* It has strangely been overlooked that Dr. James Cowles Prichard, in his "Researches into the Physical History of Mankind," published in 1826 (2nd ed.), should have most distinctly formulated the doctrine that acquired characters are not transmitted.

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prime factor, or even as a factor of any value, in specific modification; it is perfectly logical to hold the mind in a state of suspension, and to declare that the theory is inadequate, but it is not given to many minds to rest content with a pure negation. It will mark a decadent period in the history of science when destructive criticism alone prevails. For my own part, I long ago came to the conclusion that the fundamental principles were established with sufficient firmness to warrant the deductive use of the theory in the same way that we use working hypotheses in other departments of science, and the result has not been disappointing.*

The essence of the theory of natural selection is contained in the phrase "utility of specific characters." The subtitle of the "Origin of Species," published in 1859 and retained in all subsequent editions, is "The Preservation of favoured Races in the Struggle for Life." The races are "favoured" because they have acquired, by the action of selection upon favourable variations, some character or characters which give them a more or less permanent footing in the economy of nature. The distinction, if any exists, between a race and a species is, as systematists well know, often quite arbitrary and frequently, if not invariably, resolves itself into a question of individual judgment. The criterion which the producer of artificial races employs as an argument in favour of community of descent from a common stock, viz., fertility, *inter se*, finds no place in the specific diagnoses of the systematists. The question whether this distinction is an absolute one remains as a subject for experimental investigation in much about the same condition as it was left by Darwin. It is surprising that this point, which, as I may remind you, is the one flaw of which the existence was frequently pointed out by Prof. Huxley, has not been taken up as a matter of serious inquiry by biologists. The want of an experimental station, to which allusion was made in my address of last year, is no doubt responsible for the

* See some remarks by Prof. Poulton in this sense (*op. cit.*, p. 143). Even Mr. Bateson, whom nobody will accuse of any bias in favour of Darwin's views, admits that "Natural selection . . . is obviously a 'true cause' at the least" ("Materials for the Study of Variation," p. 5).

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absence of work in this direction. I am glad to say, however, that, thanks to the zeal of our distinguished Fellow, Mr. Francis Galton, there is some prospect of this want being supplied at no very distant future. From the theoretical side, Dr. A. R. Wallace's ingenious treatment of this problem is doubtless familiar to all who have considered the question.*

It seems necessary to apologise for occupying your time with this recapitulation of old and well-worn topics. But in the discussion at the Linnean Society, and subsequently in "Nature,"† the whole question of the utility of specific characters, and with it the interpretation of the principles of the selection theory, has again been raised. The question is of supreme importance to entomologists, because the difficulties which have prevented many workers in our subject from accepting natural selection as a sufficient cause of species transformation, appear to me to be largely, if not entirely, due to the meaning of the term "utility" as applied to specific characters. In fact, the various opinions expressed by those who have taken part in the discussion, resolve themselves into a few very simple questions: Are the systematic characters by which species are diagnostically separated from one another, those characters which, according to the theory of natural selection, have given their possessors that advantage in the struggle for life which has led to their survival? Are the external, visible, appreciable, measurable characters alone to be regarded as of selection value? May not some at least of the minor, more or less, constant "specific" characters be the outward expression of some constitutional or physiological differences at present beyond the power of our methods of discrimination?

The chief objection which has been urged against this last view is that it necessitates the extension of the meaning of the term "correlation" beyond that originally assigned to it by Darwin. Even if this were the case I do not, for the reasons already stated, attach much weight to objections of this class. If Darwin in his time did not contemplate cor-

* "Darwinism," pp. 173-179. See also a letter by the writer, in "Nature," 1886, Vol. XXXIV., p. 384.

† 1893, Vol. LIV., pp. 245, 293, 342, 365, 413, 435, 460, 491, 529, etc.

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relations of this order, I fail to see why we should not consider them now. As a matter of fact it does, however, seem to me that Darwin did most distinctly admit this principle of physiological correlation. There is, for example, the well-known argument of Dr. Wells, quoted by Prof. Ray Lankester, correlating the colour of the dark-skinned races of man with immunity from the attack of malarial fevers. It will be found, moreover, on reference to Darwin's writings, that he gives many similar instances showing that, even within the limits of the same species, certain constitutional differences, such as immunity to natural poisons, are correlated with external differences of colour, etc. There is, among others, the familiar case of the black hogs of Virginia being less subject to succumb to the effect of eating the root of *Lachnanthes tinctoria* than those of other colours.* The same principle is adopted and extended by Wallace,† who, in his last paper, sums up the position by stating that "every truly *specific* character is or has been useful, or, if not in itself useful, is strictly correlated with such a character."‡ There is here no limitation of the term to structural correlations only, and I learnt from my friend, Dr. Wallace, after the meeting, that he admitted correlation, in the sense advocated by Prof. Lankester and myself during the discussion. In justification of my own view I will beg permission to quote from an obituary notice of Darwin which was written in 1883, and which I now only make use of because it occurs in a publication which may not be generally accessible:—

"It is most important to bear in mind that Darwin's prime mover, natural selection, acts not only upon external characters, but likewise upon internal organization; minute constitutional or physiological deviations at present utterly beyond the ken of science, can be seized upon and perpetuated

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* "Origin of Species," 6th ed., p. 9; "Variation of Animals," etc., Vol. II., pp. 227-230 and 336; "Life and Letters," Vol. II., p. 300. See also the concluding part of Chap. XXV. of the "Variation of Animals," etc.

† "Darwinism," pp. 140, 170. Also the section on the direct action of the environment, pp. 418—420. See likewise Note 2, p. 42, of Weismann's latest essay on "Germinal Selection," 1896.

‡ "Journ. Linn. Soc.," Dec., 1896, Vol. XXV., p. 496.

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by this agency when of any advantage to the possessor. The survival of the fittest is utilitarianism *in excelsis*."*

In endeavouring to interpret specific characters from the utilitarian point of view we have therefore to consider not only the possibility of direct, but likewise the possibility of indirect utility. If the direct and obvious utility of every diagnostic character be insisted upon as an essential condition of the theory of natural selection, then we are imposing upon that theory a burden which its founders did not and do not sanction. If in the name of that theory we are told that all the trivial differences of colour, pattern, marking, etc., with which entomological systematists have made us so abundantly familiar, must be assigned a *direct* use in the economy of the species, then it appears to me that we are pushing Mr. Darwin's teaching beyond its legitimate limits, and I for one should candidly confess that the theory had broken down. I should be among the first to admit that such a strain could not be borne by the doctrine, and that an implicit faith in the direct adaptational value of every detail would transcend the limits of legitimate scientific faith. But it cannot fairly be urged that either Darwin or Wallace have narrowed us down to this restricted view. The tenour of their teaching is simply to urge caution before deciding that such or such a character is not of adaptational value, a caution which has surely acquired greater and greater significance with the progress of discovery since the promulgation of the theory. Of all classes of the animal kingdom, insects have furnished the most numerous and the most striking examples of the adaptational value of characters which, but for the light of the doctrine, would be absolutely devoid of meaning.†

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* "Trans. Essex Field Club," Vol. III., p. 81.

† A most remarkable contribution to this phase of evolutional biology has recently been furnished by Mr. Walter Garstang with respect to Crustacea. See his paper "On the Functions of certain Diagnostic Characters of Decapod Crustacea," read at the last Liverpool Meeting of the British Association; also "Contributions to Marine Bionomics; the Habits and Respiratory Mechanism of *Corystes cassivelaunus*," "Journ. Marine Biol. Assoc.," Vol IV., p. 223. Mr. Garstang informs me that a more complete paper is in course of preparation.

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The *à priori* considerations which appear to me to justify the belief that correlation may exist between obvious and concealed characters, and that such correlation is therefore a worthy subject of investigation, are, in the present imperfect state of knowledge, necessarily of a very general character. The complexity of the living organism regarded as a machine actively transforming matter and energy, renders it almost certain that any variation in a particular structure or function must be accompanied by a simultaneous modification of some other structure or function. Moreover, since every external part of the organism is more or less variable, it is a fair inference that internal parts are also variable. On this point there is much actual evidence with respect to the higher animals, but little or nothing is known about the internal variability of the "lower" animals, and this remark is particularly true with regard to insects. Now, if internal structures are variable, there is no reason why internal functions should not also be variable. If, therefore, natural selection can take advantage of variations of structure, I do not see how we can refuse to admit that it can take advantage of variations of function when such modifications are required in response to some change in external conditions. It is to this point that I wish particularly to direct attention on the present occasion, because in view of the more obvious action of selection as an agency capable of leading structural modifications in desired directions, it has not been sufficiently insisted upon that functional variations must equally come under its influence. It is no doubt due to the circumstance that variability of function is so very much more difficult to deal with by observational or experimental methods than variability of structure that the contributions of morphology to the theory of descent have hitherto far outweighed those of physiology.

If it be admitted on such grounds as these that diagnostic characters may not as such be of direct selection value, the systematist will do well to pause before declaring the inadequacy of natural selection in any particular case. There are many characters of direct and obvious utility, such as those connected with the procuring of food, defence, concealment, or other means of protection, secondary sexual

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characters, characters for insuring specific segregation (Wallace's "recognition marks"), etc. Then also there is the possibility of functional change, such for example as the ocellated spots on certain Sphinx larvæ which may have been originally developed for terrifying enemies and afterwards, in some species, converted into protective markings, or *vice versa*.* With regard to colour and pattern as a means of recognition—I mean, of course, by the insects themselves and not by systematists—a wide field for observational entomology has been opened up by the suggestion. That such characters are of value for the purpose of recognition would appear probable from certain well authenticated observations which indicate a temporary failure of the process. I refer to those cases where a male butterfly has been seen pursuing a mimetic female of another species until he discovered his mistake.† This seems to show that the male is guided at first sight by visible characters.

At the risk of digressing from the main topic of my address, I cannot avoid dwelling a little longer upon this all-important distinction between diagnostic characters and those of utilitarian significance from the selectionist's standpoint. In the class of insects most particularly is it necessary to bear in mind that our systematic methods are more or less artificial. The "species" are generally described without reference to life-history, without a knowledge of habit, often in profound ignorance of the function of the structural characters which are made use of for diagnostic purposes. He must, indeed, be a bold systematist who unhesitatingly declares that this or that specific character *must be* non-significant, and therefore cannot have been produced by natural selection. This attitude has always appeared to me as much wanting in scientific caution as that opposite and illogical rashness with which the supporters of the theory of evolution by natural selection are sometimes credited. It is much about the same attitude as

* Weismann's "Studies in the Theory of Descent," English Edition, p. 365. The tailed wings and ocelli in certain species of *Thecla* may possibly come under this heading. See Poulton's work on "The Colours of Animals," p. 207.

† Ann. Mag. Nat. Hist., 1878, p. 158.

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might be ascribed to a savage who, never having seen a watch in movement, was for the first time shown the silent mechanism, and who, in complete ignorance of its mode of action, declared his belief that this or that wheel was useless. Surely it is more scientific to use a reasonable hypothesis as a weapon instigating inquiry into all possible uses of specific characters than to put one's own negative conclusions in the place of positive knowledge.

To realise fully how much of importance may be dropped out of consideration by paying exclusive attention to the external characters of cabinet specimens, it is only necessary to recall the numerous cases of mimicry and protective and aggressive resemblance which are so commonly met with among insects. I take it for granted that the characters which contribute to these disguises are useful. If utility is not obvious in all such instances, then nothing in the realm of organic nature will bear the interpretation of utility. Would any naturalist accept as an explanation of these phenomena the statement that there existed a natural force tending to mould organisms into a resemblance to their environment? We might as well say that the laws of planetary motion were brought about by the intervention of guiding spirits, as was the belief of pre-Newtonian astronomers. Now these adaptive and demonstrably useful characters are surely "specific," whether the systematist attaches much or little weight to them in his diagnoses. Moreover, the disguise is enhanced and, in many cases, is only really effective when combined with certain habits which are not, and cannot be taken into consideration in ordinary diagnostic work. Nevertheless, such habits are as truly "specific" as the form, colour, and pattern with which they are associated. The attitude of a stick-like Geometer larva, of a flower-like Mantis, or of a deceptively marked spider, is as fairly attributable to natural selection as the form, colour, and pattern. Such habits must also be associated with specialisations of nervous function—with psychological characters which find no expression in modern systematics.* It is obvious

* For remarks on this subject see Chap. I. of Lloyd Morgan's recent work on "Habit and Instinct."

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that diagnostic work, as at present conducted, gives us only a restricted view of specific characters. Before pronouncing upon the inutility of any character we should do well to bear this fact in mind; I put forward once again a plea for studying the action of the living machine *as a whole* before we decide that any single detail of structure or function is useless.

The correlation of habit with protective and aggressive resemblance,* is to me one of the most striking illustrations of the power of natural selection to utilise internal, in this case psychological, characters.† I may remind you that on the doctrine of the non-transmissibility of acquired characters, such habits are to be explained in the same way that we account for useful structures, viz., by the action of selection upon psychological congenital variations, and not by the inheritance of a habit assumed by the individual during its lifetime.‡ From this same point of view it may be remarked in passing, that the whole subject of habit and instinct

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* Ann. Mag. Nat. Hist., 1878, p. 158. Also Lloyd Morgan, *op. cit.*, p. 11, *et seq.*

† This point was fully recognized by Darwin and Wallace in their original essays in 1858 (See Poulton's "Charles Darwin and Natural Selection," pp. 78, 79).

‡ I use the word "psychological" in the general (Spencerian) sense of indicating nervous function. Objections as to the improbability of such complex correlations having arisen through the action of natural selection because of the chances against the necessary co-adaptation of structures and functions ever occurring in individuals never appeared to me to be of any weight. Underlying these objections there is the gratuitous assumption that the different components of the complex of characters have all been developed *simultaneously*. But no evolutionist of the selection school has ever asserted that this has been the mode of development of such characters. It is more reasonable to believe that the various components have been added successively in the order of time during the phylogeny, and that we now behold the summing up of the results of a long series of superimposed characters, some external and obvious, others internal and latent, but all of use by direct or indirect adaptation (see Wallace's "Darwinism," p. 418; also the present writer in "Nature," Vol. XLIII., pp. 410 and 557, and Vol. XLIV., pp. 7 and 28). The late Dr. Romanes admits that if co-adaption can be proved to result from a blending of adaptations, the difficulty would disappear ("Darwin and after Darwin," Vol. II., p. 68). Unfortunately the element of time interposes itself as an obstacle to the experimental investigation of such problems; more hopeful would appear to be the study of the comparative ontogeny in allied groups of species.

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internal differences incapable of being estimated by our present methods.*

From these considerations another step brings us back to physiological correlation. If variability of nervous function can be seized upon by natural selection, it is but reasonable to suggest that variability of other internal functions can also be utilised when of advantage. Of the functions discharged by the internal organs other than the nervous system, all those obscure chemical processes concerned with metabolism and nutrition, waste and repair, secretion and excretion, and so forth, must be in adjustment with the life conditions of the organism. If species are adapted to their mode of existence, as is admitted by all schools of evolutionists,† the selectionist must explain the physiological adaptation in the same way that he explains the structural adaptation, viz., by the survival of individuals whose physiological processes are best in harmony with their mode of life. But this explanation starts from a variability of physiological function, and here I confess that systematic observation is sadly wanting. Considering, however, how much practical difficulty surrounds the investigation of the physiology of any one organ, even in the higher animals, it is by no means surprising that the question of functional variability of this kind should not hitherto have received the same attention from physiologists that the more obvious structural variability has received from the morphologists. From analogy with the known variability of structure it is fair to infer that a physiological variability also exists,

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* "What student of the animal kingdom is ignorant of the deep correlation existing between seemingly immaterial outward characters and important points in internal organisation, so that artificial systems built on the former alone nevertheless result in a grouping quite corresponding to natural relationships?"—From a lecture on "Zoology since Darwin," by Prof. Ludwig von Graff, "Natural Science," Vol. IX., p. 366.

† "Not only do specific forms exist in nature, but they exist in such a way as to fit the place in Nature in which they are placed; that is to say, the specific form which an organism has, is *adapted* to the position which it fills . . . . the adaptation is not absolute."—Bateson's "Materials for the Study of Variation," p. 3. "Darwin's 'survival of the fittest' we may alone regard as absolutely demonstrated as a real factor, without committing ourselves as to the 'origin of fitness.'"—From the fifth (Prof. H. F. Osborn's biological lecture, delivered at the Marine Biological Laboratory of Wood's Holl; Boston, 1895.

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with the range of which we are at present ignorant. At any rate, it appears to me inconceivable that any change of environment requiring a modification of structure of sufficient magnitude to rank as diagnostic in the systematic sense, should not also be accompanied by a greater or less amount of physiological readjustment.

The practical outcome of the foregoing suggestions is the very pertinent question whether morphological are not also physiological species, in the sense of having specific physiological activities—if not invariably, at least in many cases.* And out of this arises the further question whether such physiological differences may not be correlated with external characters which might or might not be considered of diagnostic value. Such characters might be non-significant from the point of view of direct utility, but, by hypothesis, they could never be harmful. The external and the internal characters are alike under the control of natural selection.† If a physiological modification is *necessarily* accompanied by some harmful outward token it could never survive; but, on the other hand, there is no reason why physiological modifications should not also be correlated with external *useful* characters, in which case natural selection could take advantage of them. We have here the suggestion that physiological variability may be the cause of external visible variability, and on this point entomology has *much to* contribute.

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* Mr. T. D. A. Cockerell has in a recent paper on "The Bees of the Genus *Perdita*, F. Smith" (Proc. Acad. Nat. Sci. Philadelphia, Jan., 1896) come to the conclusion that "the essential distinctions between species are physiological, the morphological ones being only valid for diagnostic purposes just so far as they happen to coincide with the physiological." I only came across this statement after the above was written. I am bound to state that the evidence does not appear to me at present to warrant such an extreme view. There must be so much in common in the physiological processes of allied species, that well-marked physiological differences cannot, without further evidence, be regarded as the universal characteristic of specific differences.

† "With cattle, susceptibility to the attacks of flies is correlated with colour, as is the liability to be poisoned by certain plants; so that even colour would be thus subjected to the action of natural selection." ("Origin of Species," 6th ed., p. 159. Also the "Variation of Animals and Plants, etc.," Vol. II., p. 229.)

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I will, in the first place, appeal, as I did last year in connection with the general subject of speculation in biology, to the green colour of leaf-feeding larvæ. It cannot be supposed that this colour is of direct physiological use in the same way that it is of use in the leaf. If it has any use at all, and I think that this has been shown to be the case, it is for the purpose of concealment. Among the first entomological guesses I ever attempted in my younger days was the suggestion that the colouring-matter of the leaf had in such cases been utilised. That guess was converted into a demonstrable fact by the experiments of my friend, Prof. Poulton, which are now so well known as to require no recapitulation. But the verification of my crude guess carries with it very wide-reaching consequences, which bear directly upon the present subject. If this character is of use, and is the result of the action of natural selection, it must have arisen from physiological variability, *i.e.*, out of generations of leaf-feeding larvæ belonging to various orders of insects there have survived those groups whose digestive arrangements were capable of allowing chlorophyll to pass in a modified form into the blood, and so to colour the larva. A physiological process of a most remarkable kind has here been called into existence because it is correlated with a useful external character. What particular organ or organs have had their functions modified for this purpose is a question of the greatest physiological interest, but does not immediately concern us now. The fact that the colour is possessed by larvæ belonging to different orders of insects points to a community of character to start from, and this is just what might have been anticipated with respect to such fundamental functions as those of a physiological nature. On the other hand, it may be necessary to point out that chlorophyll does not furnish the only road to green coloration in animals, because there are many green species in which this substance cannot have been utilised in the way that has been indicated.

From community of internal function, such as may fairly be regarded as the characteristic of physiological processes, it is not a very rash jump to the suggestion that all or many of those causes of species transformation which have been

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grouped under the headings climate and food, direct action of the environment and so forth, may be of the nature of physiological adaptations correlated with external significant or non-significant characters. Certainly where colour as the result of pigmentation comes into question, such a view seems unavoidable. Of all the characters which appeal to the eye of the systematist, colour, when due to pigment, is one of the most obvious products of physiological activity. In harmony with this view is the fact that where colour variability exists—and there is no character more obviously variable—it is generally pigment colours that are concerned, and not those due to physical structure such as striation or lamination. Moreover, the observations of Mr. Gowland Hopkins, to which I referred last year, and which have now been published *in extenso* in the "Philosophical Transactions" of the Royal Society,* show how an excretory product, uric acid, can be utilised in the production of colour and pattern. I say "utilised" advisedly, because uric acid itself is colourless, but can give rise to coloured products by chemical transformation. In the case of mimetic Pierids, some of which have been examined by Mr. Hopkins, the coloured derivatives of uric acid are of direct use because they contribute to the disguise. Therefore, it may be said that natural selection has here made use of physiological variability by picking out individuals whose uric acid transforming powers were capable of being exerted in a particular manner, *i.e.*, those individuals having an advantage in the way of approximating to the model in colour and pattern. And what is true of uric acid must be true of all other physiological products, whether they are utilised for the production of colour and pattern or for any other purpose. Thus the secretions employed for defensive purposes, such as the formic acid of the larva of *Dicranura vinula*,† the butyric acid of *Carabidæ*,‡ etc., may fairly be ranked with those characters which, like adaptive colouring, have an obvious use. If this be admitted we claim

* Vol. 186, 1895, B., pp. 661-682.

† Poulton, Trans. Ent. Soc., 1886, p. 157: "The Colours of Animals," p. 274.

‡ Pelouze, *Jahresbericht über die Fortschritte der Chemie*, 1856, p. 716.

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these products and the mechanism which produces them as the result of natural selection acting upon physiological variability as a basis. Whether these defensive secretions have been directly developed for that particular purpose, or whether, as appears more probable, a waste-product of metabolism has been utilised, is at present an open question, but the main contention that physiological processes can be brought under the influence of natural selection is not thereby influenced.

In cases such as have now been considered there are outward, visible, and therefore "specific" characters in the systematic sense, such as colour, the formic acid gland, etc., which may be regarded as the correlates of special physiological processes. But if external characters such as these, which are significant, can be legitimately correlated with special physiological activities, is it not reasonable to suspect that there may exist in any species special physiological activities which are equally correlated with external non-significant characters which have been allowed to persist simply because they are indifferent? It seems to me that such a suspicion would be well founded. It is not going too far to say that the pigment colours of organisms generally are due to their special physiological activities, and any modification of these activities would result in a modification of colour. Now, those external conditions classed under the action of food and climate, etc., are just those conditions which might be expected to affect physiological processes. If these processes are thus affected, a local race, or "geographical species," or, as far as we know, a permanent species, might be produced by a true process of physiological selection—not in the sense used by the late Dr. Romanes—but by the ordinary operation of natural selection. The suggestion is, I venture to think, worthy of serious consideration. The mode of action may be rendered more explicit by an example.

Supposing a butterfly physiologically susceptible to climate, *i.e.*, a species whose special vital chemical processes are upset in the pupal state by change of temperature, degree of humidity, etc., ranges into new districts, or experiences a change of climate in its own region. Since no two indi-

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viduals can be expected to be influenced by external conditions in precisely the same way, there would at first arise a fluctuating and undirected variability, representing physiological modifications, of which some would be better adapted to the changed conditions than others. Those individuals whose physiological processes were best suited to the new conditions would survive and gradually supplant the less suited individuals in the usual way. This might be called natural physiological selection. With this change there would occur a simultaneous change of external correlates—the outward manifestation of the internal readjustment; the undirected variability would become more definite, and, finally, the species would become transformed by a process which at first sight might appear to be simply climatic, but which in reality would have been brought about by the displacement of the physiologically unfit. Or, again, a species might experience periodic climatic change in its own region, and require periodic physiological readjustment. Of all the functions of an organism, those classed as physiological are probably the most elastic—the most susceptible of meeting new conditions. In insects undergoing complete metamorphosis, the pupal period of histolysis and histogenesis is no doubt as critical physiologically as it is morphologically. But an exaggerated physiological elasticity is required to meet some kinds of periodic change, such as that of the seasons, and it is worth considering the whole phenomenon of seasonal dimorphism from this point of view. Is it not that the two seasonal forms represent different physiological forms, the special activities being adjusted to differences of temperature, amount of moisture, etc.? May it not be that the selection of individual physiological adaptability has brought about this result? If these questions can be answered in the affirmative, then the experiments of Dorfmeister, Weismann, Edwards, Merrifield, Fischer, Standfuss, and others, simply mean that these observers have produced, by the action of temperature, an effect upon pupæ which by natural selection have been rendered adaptable* to changes of temperature, and that the

* This remark, of course, only applies to species which *have become* seasonally dimorphic, and of such species only to those in which the two

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effect thus produced upon the pupal physiology finds visible expression in the colour and form of the imago. I may call attention, in connection with this point, to a very valuable contribution to the physiology of wing pigments in Lepidoptera, by Mr. A. G. Mayer, who has recently shown that the pigments of the scales are derived from the blood (hæmolymph) of the pupa.* If, therefore, any systematist asks of what use it can be to a butterfly or moth to have a winter form of a different size, colour, and pattern to the summer form, an answer might be suggested on the above grounds. And if, further, the adaptability of the pupal physiology makes itself manifest in this way in the imago, why should we not regard permanent climatic change as a possible cause of species transformation through this same process of physiological adaptation ?†

The question of the utility of specific characters in the form that it has assumed of late years, appears to me to be

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forms are not modified for direct protective purposes (Weismann's "direct seasonal dimorphism"; see this author's "New Experiments on the Seasonal Dimorphism of Lepidoptera," Eng. Ed. from "Entomologist," p. 37, *et seq.*). When temperature changes induce modification in species which are not ordinarily seasonally dimorphic, then the influence may be ascribed either to reversion or to "direct action" on physiological function. But the latter could not (on Weismannian principles) give rise to permanent seasonal dimorphism (if required by the species) unless the physiological modification corresponded with some increased fitness for a higher or lower temperature, in which case selection would act in the usual way. Perhaps this is what Standfuss had in mind when he says:—"These experiments give rise to *phylogenetic* forms; forms, that is, which are nowhere to be found on the earth at the present day within the compass of the species, but which may either have existed in past epochs, or may, perhaps, be destined to arise in future" ("Entomologist," May, 1895, p. 146). In other words, the physiological disturbance induced by temperature change produces results in the imago which may furnish the raw material for a visible seasonal dimorphism in the future or which have already been made use of for this purpose in the past, the lost character reappearing when the physiological processes are submitted to the same influence as that under which they were developed.

* "Bull. Mus. Comp. Zoo. Harvard Coll.," Vol. XXIX., pp. 211—236, No. 5, June, 1896.

† After the above was in type I was made aware by Mr. J. W. Tutt, that he had stated similar views before the City of London Entomological Society on Dec. 1st, 1896. I was, of course, ignorant of this at the time of writing, and I am indebted to Mr. Tutt for forwarding me advanced proofs of his address. It is to me interesting to find that we have arrived by different roads at somewhat similar conclusions.

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the result of an attempt to force upon the theory of natural selection a narrow and rigid interpretation which is not warranted. When we hear that such or such diagnostic characters are too trivial to be explained on the Darwin-Wallace principles, there is underlying such criticism the quite gratuitous assumption that every external character must be in direct and obvious relationship with some external condition of life—that there must be some manifest adaptation, such as that between a key and its lock. My object in this address is simply to plead for a relaxation of this rigid interpretation of the term "utility." The theory has always been conceived by me to be not only a theory of obvious adaptations, but also a theory of latent adaptations. It is not only a theory of obvious and latent adaptations, but it is also a theory of obvious and latent adaptability. All those cases of variable protective colouring which entomological observation has brought to light, such as the colour adaptability of larvæ and pupæ, may be referred to physiological correlation. The adaptability is manifest to us only through its visible token of colour; of the nature of the physiological processes which have been utilised by natural selection we are as yet ignorant. Poulton's researches have brought us many steps nearer to the intermediate mechanism, but there is yet a long road to traverse before the mode of action of the external stimulus (in this case light) upon the physiological processes can be rendered apparent.* All that is now claimed is an extension of the principle of physiological adaptability from obviously significant characters to those which may be functionless from the point of view of direct utility, but which may, nevertheless, be of supreme importance when regarded as physiological correlates. If such characters are sufficiently constant in the assemblage of individuals constituting a

* In interpreting results of this kind by the selection theory, it may be advisable to point out once again, that "co-adaption" offers no fatal objection. It is not necessary to suppose that a complex colour-adaptability was developed all at once. There may first have arisen a responsive power of change towards one colour, and then at a later period a similar power for another colour, and so on until, in the most highly perfected species, all possible natural contingencies were provided for.

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species to take diagnostic rank, then the systematist may pursue his labours with renewed zest, inspired by the idea that there is something more underlying his studies than the association of a name with a "type."

How far the principle of physiological correlation will enable us to explain trivial and non-significant characters I will not pretend to say. I merely formulate the suggestion in order to prompt observation and experiment, and I ask systematists to allow that indirect utility of this kind may have to be reckoned with. In the interpretation of diagnostic characters we have to consider that some are obviously useful now, that others may be ancestral, that others are obvious correlates, that others, again, must have some direct use of which we are ignorant, and that a residue of inexplicable characters may exist of which some are the correlates of latent specific characters. Considering the small amount of progress that has been made in the physiology of the lower classes of animals, it is not surprising that I should have been unable to draw largely upon entomological examples. It is certainly to me a matter of wonder that the species question should not have been handled to a greater extent by professed physiologists. Most cordially can I endorse the recent utterance of Prof. Ludwig von Graff:—

"Looking back, we see how in all the chief branches of zoological science the theory of descent newly formulated by Darwin has become the motive of a thoroughness in research not found in any earlier period. It is characterised by the preponderance of the morphological interest, which has led to such a one-sided neglect of physiology, that to-day, when the development of morphology forces the formulation of questions whose answers experiment alone can supply, neither the methods of work nor the worker himself are at hand to solve them."*

Although in the absence of a sufficient body of definite experimental evidence physiological correlation can only be regarded as a hypothetical factor in the production of specific characters, it has appeared to me sufficiently pl

* "Natural Science," Vol. IX., p. 368.

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speculation to formulate the idea into a working hypothesis worthy of the attention both of systematists and of physiologists. One of the most promising lines of advancement in the future is in that field where these two classes of workers will co-operate. A large amount of observation is on record which will bear interpretation by this hypothesis, but much of it requires confirmation, and all is more or less indefinite. Whole chapters of facts which have been accumulated by writers on evolution since Darwin's time might profitably be reconstructed from this point of view. The nearest approach to the systematic treatment of physiological correlation that I am acquainted with is to be found in H. de Varigny's little work on "Experimental Evolution,"* but even this author does not make any attempt to co-ordinate his results in the light of the selection theory.

The experimental and observational verification of the hypothesis is obviously surrounded by immense practical difficulties—the difficulties naturally arising from the complexity of the phenomena presented by living organisms, the imperfection of our resources, the obstacles in the way of disentangling one particular factor out of a multitude, and so forth. None the less does it appear to me of the greatest importance that the problem should be seriously attacked by any and every means in our power.† The facts themselves are

* Lectures delivered in the University Hall, Edinburgh, 1891. "Nature Series," 1892. Many of the observations in Prof. Karl Semper's work on "Animal Life," "Internat. Sci. Series," are also worthy of being reconsidered in connection with physiological correlation, as well as certain chapters in Eimer's "Organic Evolution," Cunningham's Translation.

† Prof. H. F. Osborn, in the lecture referred to, argues in favour of new and unknown factors in organic evolution on the ground that the old factors are inadequate. He says (*loc. cit.*, p. 82):—"We are far from finally testing or dismissing these old factors, but the reaction from speculation upon them is in itself a silent admission that we may reach out for some unknown quantity. If such does exist there is little hope that we shall discover it except by the most laborious research; and while we may predict that conclusive evidence of its existence will be found in morphology, it is safe to add that the fortunate discoverer will be a physiologist." The only point on which I should differ from my friend, Prof. Osborn, is that the "unknown quantity" should necessarily be outside the pale of Darwinism. Physiological characters must be as subject to natural selection as morphological characters; physiological fitness must be as important an element in determining survival as morphological fitness.

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most difficult to ascertain, and when ascertained most difficult to interpret. Consider, for example, the case already alluded to, the relative immunity of dark-skinned races from malarial fever, which fact was made the basis of a restricted theory of natural selection by Dr. Wells, in 1813. The most reasonable interpretation that can be placed upon this observation is that the dark-skinned races have already undergone the action of natural selection by the elimination of those individuals most sensitive to the attack of particular micro-organisms. There has thus arisen a race less liable to malarial fever than the white races which have not been for so long subjected to this selective process. Since the dark races come from regions where malarial fever is most prevalent and fatal, dark pigmented skin has become associated with immunity from this class of diseases. The immediate cause of the immunity, whether, as suggested by Prof. Ray Lankester, "a certain germ-slaying quality in the phagocytes," or any other quality of the blood, is physiological, and natural selection may therefore be considered to have acted in this case by taking advantage of physiological variability. But the difficulty of interpretation will appear when it is called to mind that selection may have had in this instance a dark-skinned race to deal with from the very beginning, so that there may be no *necessary* correlation between the colour and the power of resisting fever germs. The dark colour of the skin may be a concomitant and not a correlate of the germ-slaying faculty in the blood. Thus in all such cases the first thing to be settled is whether a particular external character is a true correlate or only an accidental concomitant of certain internal physiological characters.

With respect to the action of food, a certain number of instances have been recorded which appear to indicate that colour, at any rate, may in certain cases be influenced by this means.* The evidence, on the whole, is not very satisfactory.†

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* De Varigny, *op. cit.*, p. 57; Romanes, "Darwin and after Darwin," Vol. II., p. 217; Beddard, "Animal Coloration," p. 48; Eimer, "Organic Evolution," Cunningham's Translation, pp. 147, *et seq.*

† Semper, *op. cit.*, p. 69. Among recent workers at this subject, Dr. Standfuss, after many experiments, obtained only negative results (see

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I personally have always felt anxious to obtain confirmation of that oft-quoted instance communicated to Darwin by Moritz Wagner, according to which a Texan species of *Saturnia* transported to Switzerland became transformed by feeding the larvæ on *Juglans regia* instead of *J. nigra*. But if food can modify an organism—and all the evidence on this point cannot be swept aside—consider the difficulties of interpretation. In the first place, we must be sure that it is the food material as such which induces the change, and not some other concomitant external change which had not been taken into account. In the next place, the food-stuff itself may act directly as a disturber of physiological processes, and so affect external characters with which the processes are correlated. But an action of this kind could, on Weismannian principles, produce only a temporary local race which would revert as soon as the source of disturbance was removed. How many systematists have applied a test of this kind to ascertain whether a named "type" represents a permanent species? Then, again, a species might be physiologically susceptible to the influence of food through having been compelled by stress of circumstances to adapt itself to changes of diet. Such individual adaptability could be conferred by natural selection by the picking out of those individuals whose capabilities of assimilation were congenitally the more elastic. It is not unreasonable to suppose, for

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the translation of his paper by Dr. Dixey, in the "Entomologist" for March, 1895, p. 75). Mr. F. W. Merrifield informs me that his own experience is in accordance with this, *i.e.*, so far as concerns Lepidoptera the nature of the larval food does not appear to influence the character of the imago, excepting in so far as it affects vigour, and "that vigour affects colouring in the way of rendering it more vivid, and, where there are several colours, in rendering the contrasts between them more striking. Where this is the case it is always or usually associated with greater size or robustness." This may be translated into the statement that certain kinds of food stimulate all the physiological functions. Mr. Beddard states that the tiger-moth (*Chelonia caja*) is "almost *the* classical instance of the effects of food upon colour" ("Animal Coloration," p. 52). If this be so—and it is certainly not in accordance with my experience—it is remarkable that varieties should be so rare, in view of the fact that the larva feeds on such a number of different plants. Moreover, when well-marked aberrations occur, they appear generally singly out of a whole brood fed on the same plant.

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example, that the success of polyphagic species, such as the species of *Hybernia*, etc., is attributable to this kind of adaptability to various distinct kinds of foliage. If, moreover, this adaptability corresponded with a visible effect upon the colour or form of any subsequent stage, we should have a character which might be considered of diagnostic value, and which might be erroneously quoted as another example of the inutility of specific characters. There is also the possibility that the action of the food may be only apparent and not real, resulting in fact from the indirect action of the colour of the surroundings upon the physiology of the individual (Poulton's factor).

Finally, the action of other external agencies may, as already indicated, be referred to physiological adaptation of the species as a whole, or to individual physiological adaptability. These two modes of action must be disentangled, and systematically conducted experimental observations alone will enable us to arrive at a satisfactory conclusion. If a species requiring concealment under variable external conditions acquires a power of individual adaptability by any physiological mechanism whatever, the stimulus under which that adjustability was first produced by natural selection will always tend to produce the necessary colour change, even when the individual is removed from its surroundings, by virtue of the conservative tendency of heredity. It inherits a power of responding to light, heat, etc. Natural selection does not concern itself with physiological mechanisms as such; it utilises their effects whether obvious or latent. The problem before us is to determine whether any, and if so, which of the "specific" characters are physiological correlates. If, as the experiments of Vulpian and Monnier, quoted by De Varigny, seem to show,* the two allied frogs, *Rana esculenta* and *R. temporaria*, differ to such an extent in their physiological characters as to react in quite different ways to the same poison, who can say that some of the diagnostic characters of these species are not the correlates of the physiological differences? These and whole groups of similar cases are await-

* *Op. cit.*, p. 130, *et seq.*

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ing investigation by the only legitimate method, viz., by experiment and observation. If, owing to the community of the physiological activities of different species not very closely related from the systematic point of view, a physiological variability gives rise to the appearance of the same type of variation (Darwin's "parallel or analogous variation"), such, for example, as melanism, or a darker suffusion of pigment, it is quite intelligible that such a type of variation, if of use, would be seized upon and perpetuated by natural selection. Thus, in accordance with Lord Walsingham's ingenious theory of the dark forms of Lepidoptera from high latitudes, an advantage is conferred upon such forms by their superior absorbing power for solar radiation. Natural selection has here again utilised physiological variability; it happens that it is a variability of a type common to widely divergent forms, by virtue of its being connected with internal processes which are common to such divergent forms. The result is that different species of butterflies and moths are alike affected, not by the direct action of low temperature, but by the selection of darker forms—by the survival of certain special types of physiological activity. But if divergent forms can be made by such means to display a similarity in external useful characters, it is conceivable that a similarity of external non-significant characters may also result in groups of different species by the selection of the physiologically fit—the adaptation in such cases having reference to latent characters. In this light "the direct action of the environment" disappears as a distinct factor of organic development.

The bearings of the suggestion which I have attempted to put into a somewhat more definite form in this address will, I hope, be perceived by practical workers. It will be realised perhaps more clearly that there is a very human element in the term "specific character," and that the differential characters which the systematist has learnt to detect with such consummate skill bear no proportional relationship to the actual differences between the forms described. It will also appear that *physical* external conditions, as factors in the

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transformation of species, may require raising into greater prominence than they have hitherto occupied. The fact that the struggle for life is not only between living forms but also between the organism and its physical environment was clearly enough perceived by the founders of the theory of natural selection, although they attributed greater weight to the former; the tendency of my remarks is simply to give renewed emphasis to the action of the physical as distinguished from the organic environment. In contemplating the fact that only a small number of the whole offspring reach maturity, we must bear in mind the possibility of physiological unfitness being a cause of elimination.*

I am most anxious to avoid the appearance of founding a new sect, and I again remind you, in concluding, that I am not laying down any new law; neither do I assert that physiological correlation is a proved factor. It is my object simply to suggest that such a factor may profitably form the subject of experimental investigation. Until we are enabled to penetrate further into the latent mysteries of the living organism and the relationship between its inner activities and the external conditions of its existence, it appears to me that discussions as to which out of a group of correlated characters, some obvious and others latent, is to be regarded as *the* cause of its survival are likely to prove barren. If, on the other hand, my remarks do but prompt further inquiry into the subject of physiological variability—if they only bring about a closer *rapprochement* between

* The problem as it presents itself for investigation may be put in other words thus:—Supposing all the offspring of one pair to be kept under identical physical conditions, supplied with plenty of food, and removed from all competition with other forms of life, would all the individuals reach maturity and, if not, what influence would determine which should survive and which succumb? It seems but reasonable to suppose that physiological unfitness for those particular physical conditions would be one important factor in determining survival. In any experiments undertaken in this direction the possible selecting action of micro-organisms must be taken into consideration. It is generally believed, for instance, as the result of Pasteur's investigations, that the larvæ of *Bombyx mori* which spin white silk are less liable to the attack of fungoid disease than those which spin yellow cocoons. If this be the case the colour of the silk is a correlate of some constitutional or physiological character of the larva.

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systematists and physiologists—they will not have been made in vain. I cannot but feel the great imperfection of my plea, but if I have been unable to offer a more substantial contribution you must attribute my shortcomings to want of time for working at any special branch of entomology. The little part that I have endeavoured to play has always been to help, I am afraid by somewhat disjointed efforts, in overthrowing that threatening notice of "no thoroughfare" which was at one time interposed in the path of speculation in our department of zoological science. The labours of those who have entered our domain by this path have encouraged and confirmed me in the belief that such efforts have not been altogether devoid of value.

OBITUARY.

Arthur Sidney Olliff, F.E.S.—Although Mr. Olliff died in December, 1895, the news of his death did not reach England until after my last address. I therefore think it necessary to refer to him at the present time. He died at Sydney, N. S. W., on December 29th, 1895. He was the only son of Mr. S. J. Olliff, of Hornsey, London, and was born in 1865, being just over thirty years of age when he died. He was first employed in the office of the late Mr. E. W. Janson, and afterwards obtained a post at the British Museum; subsequently he was curator and private secretary to Lord Walsingham. In December, 1884, he left England, having obtained a position in the Australian Museum at Sydney. In 1890 he was appointed Government Entomologist in connection with the Agricultural Department of New South Wales. He recently published an important official pamphlet of fifteen pages with four plates, on the so-called "vegetable caterpillars," under the title "Australian Entomophytes." He joined the Entomological Society of London in 1886.

Edward Armitage, R.A., F.E.S., died at Tunbridge Wells, on Sunday the 24th of May last, from apoplexy and ex-

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haustion following pneumonia, after having been ill for about three weeks. Mr. Armitage was born in London in 1817, so that he had but just completed his 79th year. Educated principally in France and Germany in 1837, he entered the studio of Paul Delaroche in Paris, and was elected by that artist to assist him in a decoration he was then engaged upon at the School of Fine Arts. At Paris Mr. Armitage exhibited his first independent work, "Prometheus Bound," and subsequently gained a first class prize of £300 in the Cartoon Exhibition at Westminster Hall, for his "Landing of Julius Cæsar in Britain." After a year's study at Rome he returned to England and exhibited his first pictures at the Royal Academy, in 1848, "Henry the Eighth and Katherine Parr" and "The Death of Nelson"; and to the annual exhibitions of that body he had, until a year or two ago, been a constant contributor. I am not aware that he ever published any papers on entomological subjects, but he possessed a collection of exotic Coleoptera, and, moreover, he was one of the oldest Fellows of the Entomological Society of London, having been elected in 1856. Some years ago he exhibited at the Royal Academy a picture of a "Sale of an Insect Collection at Stevens's Great Rooms."

Peter Inchbald, F.L.S., F.E.S.—This well-known Yorkshire naturalist died at Hornsea, Yorkshire, on 18th June last, in his 82nd year. He joined the Entomological Society in 1880.

Miss Georgiana Elizabeth Ormerod, F.E.S., died at St. Albans, Herts, on August 19th, aged 78. She was a daughter of the late Dr. George Ormerod, and a sister of Miss Eleanor A. Ormerod, so well known as a writer on economic entomology. She was an accomplished artist. Miss G. E. Ormerod was elected a Member of the Entomological Society of London in 1880.

Auguste Sallé, F.E.S.—This well-known French entomologist died at his residence in Paris, on May 5th, in his 76th year. M. Sallé travelled much in the Southern States, the West Indies, Central America and Venezuela, making collections in all branches of entomology. On his return he established himself as a Natural History Agent in Paris. He

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several times took temporary charge of important collections; the rich collection of Baron de Chaudoir was, it is said, in his house during the siege of Paris, in 1871. His Central American collections were purchased by Messrs. Godman and Salvin, and formed part of the materials for the "Biologia Centrali Americana." Most of his papers were published in the "Annales de la Soc. Ent. de France," of which Society he was elected a Member in 1852. He joined the Entomological Society of London in 1875. Sallé was extremely genial and courteous in his manners.

Arthur Dowsett, F.Z.S., F.E.S., died at Reading, on the 6th November last. He was formerly in business in Brighton as a dispensing chemist, and on retirement from business went to reside at Reading. He was one of the founders of the Reading Natural History Society, and had occupied the position of President of the Society since 1884. Mr. Dowsett possessed large collections of birds and insects. Beyond a few notes in the "Proceedings of the Brighton and Sussex Natural History Society," and in the "Entomologist," I am not aware that he published anything on the subject of entomology. He joined the Entomological Society in 1874, and the Zoological Society in 1876.

Amongst the names of other entomologists, not Fellows of the Society, who have died during the year, the following deserve mention:—

Julius Flohr.—This well-known Coleopterist died in Vera Cruz, Mexico, on February 8th, after a few weeks' illness. He was born at Hamburgh in 1837. He was educated in his native city, and from his boyhood took an interest in Coleoptera. After several years' residence in England he went to Mexico in 1859, and entered a banking-house in which he subsequently became a partner. In 1877 he retired from business, and from that period to the time of his death he devoted his attention to the investigation of the Coleopterous fauna of Mexico. To him we are largely indebted for a knowledge of the Coleoptera of that country. He was always ready to assist the contributors to the "Biologia Centrali Americana" by working up neglected groups. From time to time he visited England,

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and made the acquaintance of Bates and many of the other leading entomologists. One or two papers on Mexican Coleoptera were contributed by him to German periodicals.

Joseph Chappell.—Joseph Chappell died on October 3rd last in Manchester, in his 67th year. By his death Lancashire has lost a fine example of its many working-men naturalists. For upwards of forty years he collected, studied, and observed the insects of the Manchester district. He rendered valuable assistance to Dr. Ellis in his "Catalogue of the Lepidoptera of Lancashire and Cheshire," and he also helped Canon Fowler in his "Coleoptera of Great Britain and Ireland." He discovered *Lymexylon navale* in Durham Park. He worked out the life-history of *Sesia culiciformis* on Chat Moss, and was the first to detect *Tapinostola elymi* as a British insect. During the Jubilee Exhibition at Old Trafford he was in charge of the exhibition of living silkworm moths. Mr Chappell was an Honorary Member of the Lancashire and Cheshire Entomological Society. His extensive collections were recently purchased by Mr. C. H. Schill.

Dr. F. F. Morawitz, who died at St. Petersburg on the 17th ult., was, I believe, the founder of the Russian Entomological Society. He was born at St. Petersburg, of Silesian parents, on August 3rd, 1827. He studied at the University of Dorpat, became physician at the Empress Marie Institute, and at various times travelled all over Europe. Twice he joined scientific expeditions to the Caucasus. He is said to have possessed one of the finest insect collections in the world.

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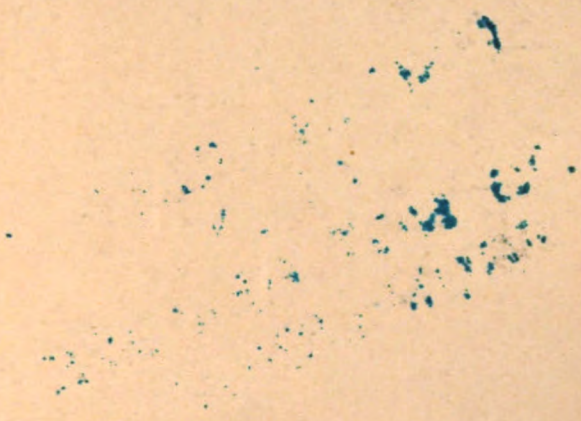

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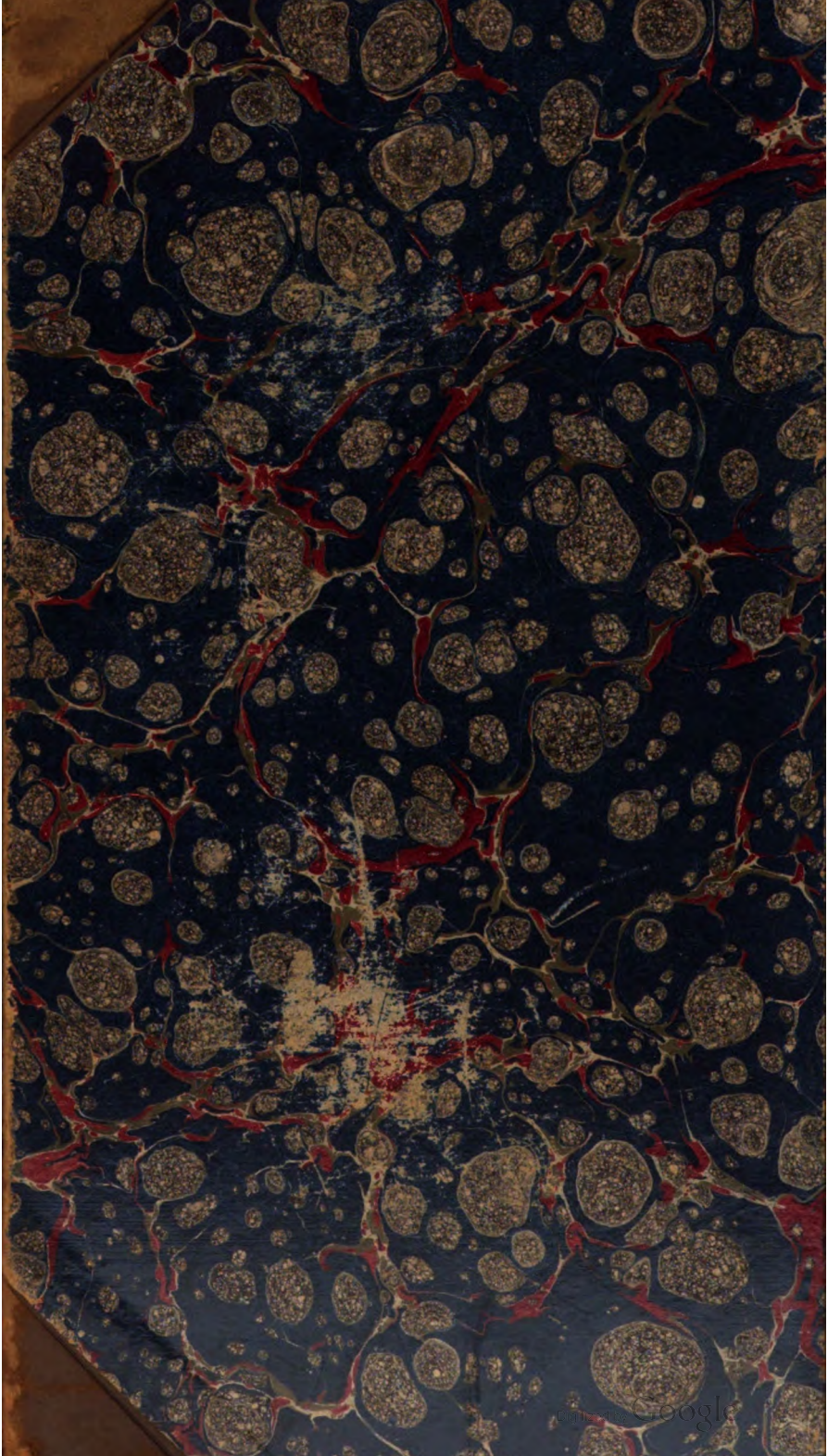
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